AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 6, No. 1. WEEKLY. | NEW YORK, JANUARY 6, 1883. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

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Westcott's Improved Drill Chuck.

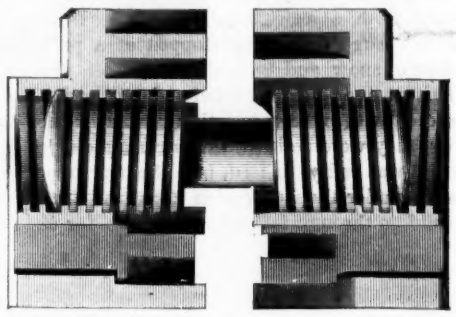
The accompanying engravings represent an improved drill chuck, as made by the Oneida Steam Engine and Foundry Co., Oneida, N. Y. As may be seen from the full-sized engravings, this chuck consists of a cast-iron shell, so constructed that the jaws and screw are contained within the chuck, so that there are no projections to throw the rotating parts out of balance or catch the sleeves or clothing of the workman. The jaws are of special tool steel, carefully made and hardened. They are made short, so that the screw takes hold in the center, so that there is no tendency to spring them when pressure is applied for holding a drill. The ends of the jaws do not project outside the shell, and the area of surface for gripping the drill is unusually large, which is an item of importance in the durability of the chuck.

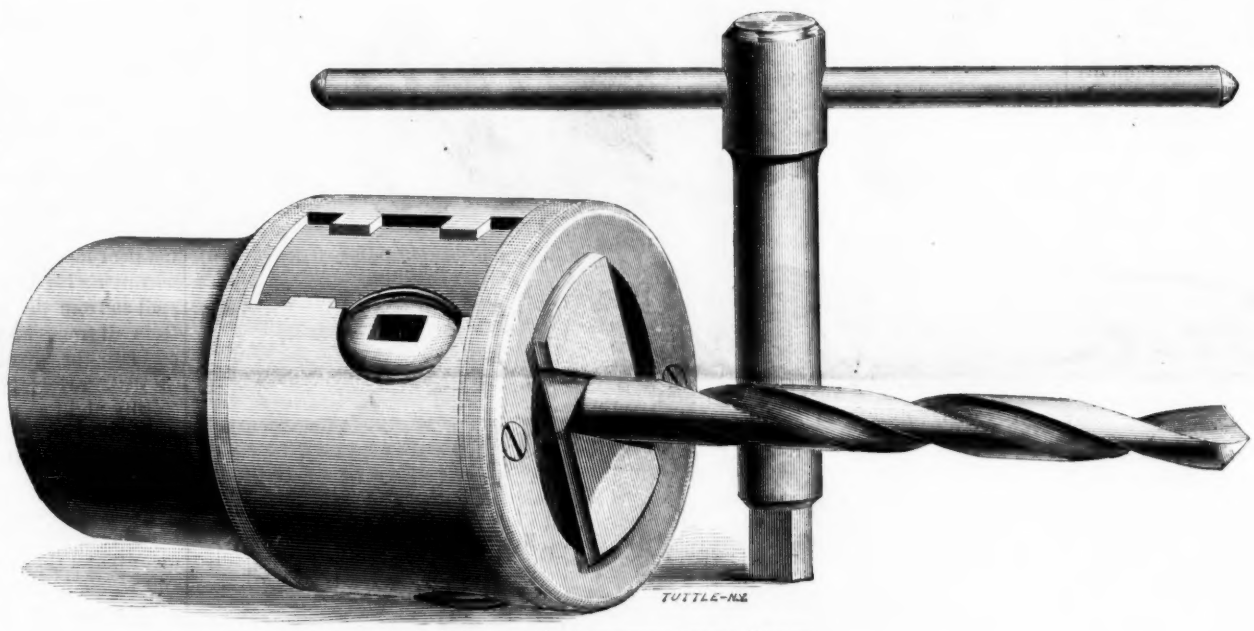
The jaws will not extend outside the body of the chuck, even when holding the largest drill capable of being admitted.

By using the tongues upon the jaws, neatly fitted, as shown, additional wearing surface and stiffness are secured. The screw is made of steel, hardened at the end to receive the square end of the wrench, which is also of steel, with the square end hardened. The sectional view of the jaws shows how the fingers are made to interlock. By a careful examination of the practical results, when power is applied to the jaws, it will be seen that large surfaces have been provided just where they are needed, and that there is no tendency through wear to throw the drill out of true. This chuck is trued upon the outside by placing a mandrel in the jaws as if it were a drill, and closing them firmly with the wrench, after which the outside is turned off and finished. The hole in the shell is bored to a standard taper, furnished by the Morse Twist Drill Company. By this process they are sure to run true every time. Instead of the taper, this hole may have a thread cut within it to fit upon the lathe spindle, or it may be made for attaching to a face plate. The chuck may be readily taken apart by removing two screws and the collar on the face.

This collar is principally to prevent opening the jaws to receive a drill so large that the jaws would be strained beyond their capacity of endurance. The screws and other parts are made to interchange. The chucks are made in three sizes, namely, Nos. 0, 1 and 2. No. 0 takes drills from nothing up to ⅝″ diameter; No. 1 from nothing to ¾″, and No. 2 from nothing to 1″.

All sizes are balanced to run at any desired speed. They are made under the personal supervision of the inventor, J. H. Westcott.





WESTCOTT'S IMPROVED DRILL CHUCK.

New Screw Cutting Engine Lathe.

We illustrate with this a new 25″ swing screw cutting engine lathe, made by Joseph B. Reed, of Cairo, Ill. This lathe is designed with a view to meet the demand for a tool that shall be strong enough for the heaviest work done on a lathe of this size, and at the same time be easily handled in doing lighter work.

The head-stock is fitted with a four-change cone of large dimensions and wide belt surface, which, with the 16″ spindle and back gear, and small pinions, provides for very strong driving.

The carriage is as low as is consistent with strength, allowing a swing of 18½ inches over the rest. It is provided with long bearing surfaces, and is gibbed both front and back. The sliding tool block has a bearing on the carriage 16 inches long, and is gibbed the entire length with a taper adjustable wedge. The compound tool block has a traverse of 11 inches.

The feed motion is positive, and can be instantly thrown in or out, or reversed. Both lateral and cross-feed is applied by means of cone gears, one of which runs in a hollow steel spindle.

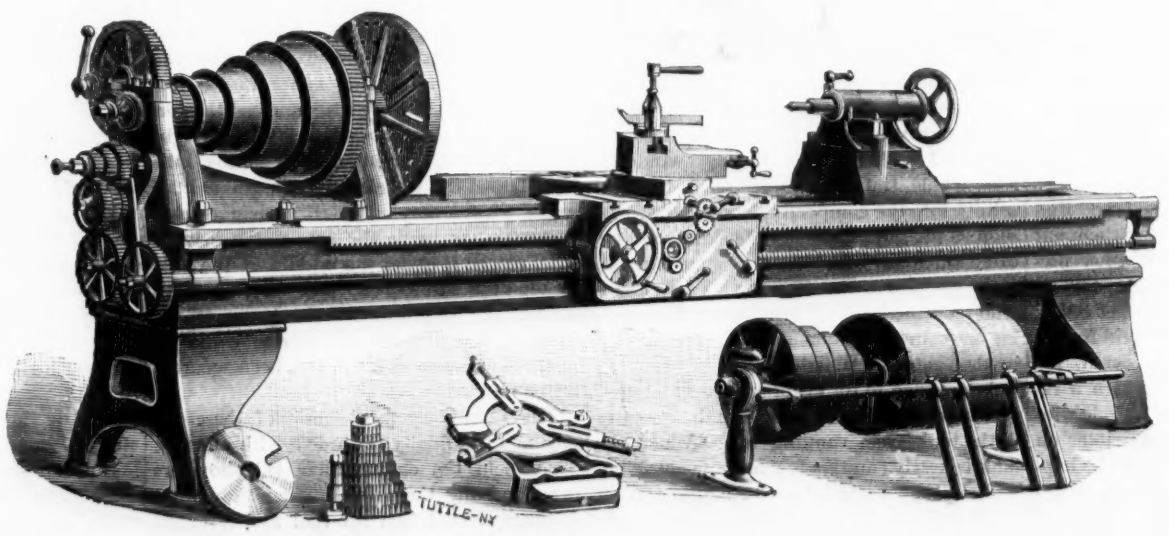
The gears are independent of each other, and are engaged or disengaged with cone gears running on steel studs made fast to a yoke, by the operation of which three changes of feed—both lateral and cross—are brought into use without changing the gears on feed screw. The cross-feed has sufficient traverse to face the full swing of the lathe.

The lead screw is also used for feeding, but the thread is used only for screw-cutting.

The lead screw, pinion studs, screws, etc., are made of cast steel, and the rack is cut from Norway iron. The sliding and bearing surfaces are fitted by scraping.

The countershaft has three pulleys each 16 inches in diameter.

Each lathe is set up and thoroughly tested at the works.



REED'S NEW ENGINE LATHE.

The industrial and mining exhibition, held last fall at Denver, Col , was so successful that it will be repeated next year, the present buildings being utilized for the purpose.

Locomotive Notes.

DAMAGE TO ENGINES FROM HEAT AND COLD —SERIOUS LOSS CAUSED BY AN ENGINE FREEZING UP IN A SNOW BANK—SUCCESSFUL PASSAGE OF A BAD SNOW BLOCKADE.

BY ANGUS SINCLAIR.

In the latitude of our Northern States, where by far the largest proportion of locomotives are employed, engines are liable through carelessness or mismanagement, to receive serious damage from the two extremes of temperature, heat and cold. A case of overheating is likely to prove destructive and expensive, but such cases are comparatively rare; and the probability is, that where severe winters prevail, more damage is inflicted upon the equipment of a road from excess of cold than from excess of heat. The moral code of enginemen deals very sharply with the engineer who burns his boiler, and the action is regarded as the most heinous professional disgrace. Railroad officers second the sentiment

of their engineers in this respect, and they seldom care to trust a man who has scorched his fire-box and tubes. This may have a deterrent effect.

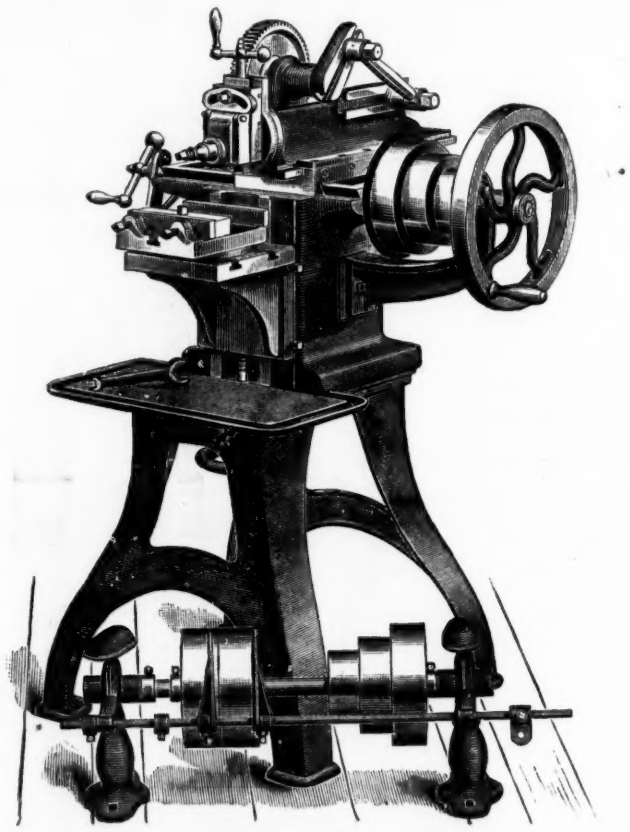
Mismanaged excess of cold is treated in a different manner. To let an engine freeze up and become helpless, scarcely casts a stain upon the reputation of an engineer, although this act may be no more excusable than the case of burning, and may entail far more serious consequences upon the company.

I remember a case where an engine pulling a stock train was overtaken by a severe snow storm on a division that passed over a rolling prairie country. The engineer had an excellent engine, equipped with two pumps and one injector, and every way calculated for successfully weathering any storm likely to be encountered. But the man was deficient in natural energy, and within three hours after the gale commenced, his engine was dead in the center of a long cutting without a rod down or a pipe disconnected. By the time the storm abated nothing about the forward part of the train was visible except the top of the smoke-stack. Resurrecting this immersed engine caused eight hours extra delay in clearing the track for traffic. This figured up expensively when the loss of stock was added in. The unfortunate predicament was brought about in this way. The engineer worked the train along as best he could through the increasing snow drifts, the unusual heaviness of traction making a deep drain upon his water tank. This he did not think about. When the train stalled in the cut where it finally settled down, the engineer cut away and proceeded to work through the snow. His first indication of the water being low in the tank was the stopping of the pump. Then he attempted to make water from snow, but it was too late. He was compelled to quench the fire before he could melt enough snow to start the injector. And while the train men were shoveling snow, the engine became so deeply imbedded in the drifts that the engineer did not see how he could disconnect pipes and rods—and it is no easy matter—so he succumbed to adverse circumstances.

There is no condition of railroad operating where the valuable attainments possessed by a really good engineer stand out so conspicuously as during the prevalence of distressing winter weather, and no condition so completely annihilates all stamina in the man of scanty natural resources.

Like every other trying ordeal, the hardships of severely cold weather, that may be reinforced by drifting snow, can be resisted or overcome most successfully by thoughtful preparation ahead. John Steel, one of the most fortunate engineers in the frigid Northwest, a man who has wrestled with the snow-drifts of twenty-five winters and never bursted a pump nor was towed in dead, attributes his uniform good luck to the practice of never depending on a mild winter, but of having his plans laid for the worst before a cold snap comes round. The first consideration in this regard is to have the means arranged conveniently for draining pipes that are exposed to danger from holding water which will freeze; then comes the necessity for being able to warm them up with steam. Injectors as a rule are more easily preserved from frost than pumps, but most injector branch-pipes will freeze up unless they are supplied with frost cocks. If a pump be carefully attended to, frost plugs will go unused for a whole winter, but the engineer who looks ahead to avoid trouble takes care that his pumps have got frost plugs, and that he has the means at hand of taking them out promptly if necessary. So with other precautionary attachments. The man least likely to need them keeps them in the best of order.

Engineer Tom Myers, of the Frigid Northern Railroad, tells with graphic detail, the story of how he was pulled through a remarkable snow siege during the terrible winter of '80. That was Tom's first winter on the right-hand side. One day when he happened to be out on the most northerly division, one of the numerous snow hurricanes of the season overtook him, and its rigor plainly indicated a block. Presently passenger train No. 62 came along, and Tom got orders to leave his own train and double-head 62, and try to force it through. The engineer of 62 was Uncle John, the oldest engineer on the road, a man ripe to the experience they were likely to go through, and a good counselor for a young runner. They coupled on and started out, Tom resolving to be governed by the advice of Uncle John, should he need it. The wind kept driving clouds of snow into every sheltered nook, so that their prospects of going far were slender; but the order to push ahead was imperative, and a hearty trial was needed to show how far they could go. Tom's engine had a low ash-pan, the bottom of which reached below the line of the pilot, and it kept raking the snow in front of the back drivers, causing persistent slipping. It was also getting badly frozen from water running from a leaky mud ring. At Uncle John's suggestion they stopped at a point clear of snow and took down the ash-pan. This gave considerable relief and they pushed ahead with renewed activity. At a station they were notified, that a certain cut in front was badly drifted, but the trackmen were under the impression that the train could go through by making a dash for it.



NEW EIGHT-INCH SHAPING MACHINE.

Both engineers accordingly prepared to do their best, and with six coaches behind them they plunged into what proved to be a snow mountain, at the rate of fifty miles an hour. A great cloud mass of snow rising from the pilot envelops the engines in complete darkness, a thundering of snow clods on the cab, a tumult of rattling and slipping of wheels, a hissing and rush of hot steam, a feeling as if one had jumped from the top of a steeple into a stack of wool, and all is over. That is about the sensation of butting into deep snow. When they came to inspect the situation, it was found that the first engine had gone into the snowbank almost to the top of the stack, and the avalanche had knocked off the head light and broken in the front cab windows. The whole train was stuck fast, wedged solidly into the compactly driven snow. So soon as the impossibility of backing out became apparent, means were at once taken to make the best of the situation. Uncle John, who took the lead, set men to work shoveling snow into the tanks, which was melted by the heaters. Where melting of snow has to be resorted to for keeping a water supply, care should be taken to prevent the quantity in the tank from running low. When the tank is nearly empty, a few minutes shoveling will chill the water below the melting point.

With the water supply assured, our train men experienced no difficulty in weathering the night which was fast approaching. The heaters were kept going just enough to keep the pipes open, and a careful watch was maintained to see that they did not stop working. There is far less labor in keeping pipes open by vigilant attention, than there is in thawing them out when they become a mass of ice. While an engine remains passive in the snow, all the steam needed is what will keep the water and pipes from freezing. When morning came there was no improvement in the position of the snow-bound train. No change in the weather. To move was impossible, and no aid could be got from shoveling, for the snow blew in as fast as it could be thrown out. All they could do was to wait for better weather. But waiting meant using up coal, and the supply of that article was limited. Calculation assured them that both engines could not be kept alive longer than another night, so they resolved to let one of them die, so that its coal could be used for keeping the other warm. The head engine was of the most importance, since it could pull out for supplies so soon as the track could be cleared, so the train engine was cooled down, With much labor and untold suffering, they burrowed in the snow and took down the main rods, screwed out the cylinder cocks, removed the frost plugs from the pumps, disconnected the water boxes and blew the live steam through the pump valves and pipes. Then they run the water out of the boiler and tank. These precautions finished, the engine was as safe from frost as if she was housed in a comfortable round-house. This honest work performed did not end the labor of the enginemen. They had just finished the moving of the coal to the live engine when its injector refused to work. Every effort was made to start it without success, then it was taken apart and the primer tube found broken. The pump was now the only resort. They disconnected the forward ends of the side rods, jacked the weight off the drivers, poured some oil on the rails and slipped the wheels till they got a little water. Then they hollowed a channel in a square block to fit the arc of the driving axle, placed it under the middle of the axle on top of a screw-jack, and raised up till most of the weight of the wheels was off the rails. With this rig the engine could be pumped as easily as if she had been securely raised on blocks.

The exemplary persistency of these enginemen was finally rewarded with success. They held the engine alive till shovelers came and dug them out. Then they went to the nearest station for fuel and returned for the other engine, which was hauled to a water tank and there resuscitated. By this means these two engines were enabled to render material assistance in opening the road for traffic, instead of helping to encumber the blockade, as would have been the case had feeble hands permitted them both to cool off in the snow.

New Eight-Inch Shaping Machine.

We illustrate with this the new eight-inch shaping machine, made by Boynton & Plummer, of Worcester, Mass. This machine will plane up to full 8″ in length, and is conveniently adjusted for shorter strokes.

The cross feed is automatic, reversible, and has a wide range from the finest to coarsest grade. The screw, as well as all the shafts, are of steel, and the wrought-iron work is case-hardened.

The cutter bar has a graduated swivel head for down and angular feed. The table has a vertical movement of 7″, adjusted by means of a screw. The driving shaft, which is strongly geared, is provided with a balance wheel fitted with a handle, by means of which the machine can be operated by hand in case of an emergency.

The machine is fitted with a swivel chuck, and other appliances required with machines of this class.

Theory versus Practice.

BY C. A. SMITH.

"That'll work all right in theory, but won't work in practice." "That may be all right theoretically, but practically it is no good."

These are examples of the stereotyped phrases that come ringing in our ears almost any day from the good mechanic and from the poor mechanic. They come from those occupying high and responsible positions, as well as from the most menial. They come from all trades and occupations; both early and late the air is pregnant with them, for they often come ringing into our ears in the "stilly night as well as in the dewy morn," until we wonder whether the lives of those who thus keep the atmosphere in constant vibration are not theoretical successes, but practical failures. What seems incomprehensible to our beclouded mind is the statement that a thing can be all right in theory, and wrong in practice. If a thing is wrong in practice, how can it be right in theory?

What is theory and what is practice? Perhaps an answer to this question will help us a little. Theory, in short, is simply an exact and correct explanation of any phenomenon or phenomena. Practice, of course, everybody understands to be the daily business and occupation of man, or, more specifically, the execution of methods and the adoption of means in accomplishing any desired end.

From these definitions (though in a condensed form) we can find no antagonism between theory and practice. On the contrary, they seem almost inseparable, bearing the relation of guide to tourist or teacher to pupil. Theory says: Do so and so, and you will get such and such a result. It is the wide-awake man—the man who is constantly making useful improvements and discovering new methods and means—who is obeying the dictates of theory to the greatest extent. It was this obedience that led to the discovery of the planet Neptune; Watts to build the first steam engine; Stephenson the first locomotive, and Fulton the first steamboat. The only way we can conceive of theory as being in opposition to practice is in an exclusive sense; that is, theory considered purely as such, in contradistinction to practice as a different field of action. As to the utility of both, it seems there can be no doubt. Those who speak disparagingly of the relations between theory and practice, do so with very little consideration, and certainly do not overburden themselves by study.

But here steps up Tom, and says there are differences between theory and practice; "for," says he, "theory says that friction is independent of surface—but, 'tisn't. I tried it once, and the more surface I used the

harder it pulled." Upon inquiry, it was found that he made his "experiments" with a belt on a pulley and varied the surface by varying the arc of contact. Further comments are unnecessary.

Dick heard once, in connection with the mechanical theory of heat, that dry steam, at a high pressure, issuing from an orifice, would not burn the hand when placed in the jet. Being somewhat incredulous he concluded to try the experiment, and accordingly, as soon as an opportunity presented itself, he placed his hand over the mouth of a teakettle from which was seen to issue a considerable quantity of steam. It is not necessary to explain how much interest he took in withdrawing the intruding hand and denouncing, most vociferously, both theory and theorist. Of course he concluded that theory was all wrong. The *ego* is never on the erring side of a question. It does seem so hard for some people to acknowledge an honest error on their part.

Again, we see Harry turning up a shaft of peculiar shape. It is quite thick in the middle and tapers irregularly towards both ends. Our first impression is that it is a connecting rod, but then we see that it is rather long for a connecting rod, and then it has no "square ends" on it for straps to fit to; so we venture to satisfy curiosity by making some inquiries. Harry courteously replies: "This is a shaft which I want to have as light as possible and at the same time as strong as I can have it, hence I make it to a parabolic form, which is the form for uniform strength, you know. There, in the middle, where that straight part is, I am going to put a pulley, which will be subjected to variable strains, and near the ends there, are the bearings."

"Would your shaft not be just as good if turned to a 'straight taper,' and save a great deal of time in turning?"

"No; it would be weakest, then, between the middle and its ends. The outline must be a parabolic curve, to be of uniform strength."

It would have taken too much time to explain to Harry, and convince him that it was not a parabolic curve he should have used in this case; but, if he wants to be "very nice" in forming his shaft, he should use the curve known as the *cubical parabola*, which has nothing in common with the ordinary parabola, or any of the conic sections, and can be laid out only by means of its equation. But, suppose our friend Harry should adopt this amendment, and lay out his curve very carefully by means of the proper equation, he would then not have a shaft of "uniform strength." He would have to modify the form further, to provide against shearing stress. After this, he should modify it still further, to allow for the weight of the shaft itself. After this is all done—the curve nicely calculated and the shaft nicely turned to it—he then has a shaft of "uniform strength" for only *one* definite load. As soon as the load on the shaft is varied, it ceases to be a "shaft of uniform strength," and would have to be reconstructed to make it such, for the new load. Harry does not seem to comprehend these points, and when he puts his shaft up and finds that it does not give the desired result, then *theory* will have to be the scapegoat of the sins in the case, both of omission and commission.

Tom, Dick and Harry never have any doubt but that their experiments and practice are in perfect conformity to the theories they are attempting to follow; but it is obvious that they comprehend them only partially. It is true, sometimes a theory is not complete; that is, it does not completely explain *all* the phenomena of the given subject. As long as men are liable to err, this cannot be avoided, and no respectable man would claim to be infallible, nor would he expect infallibility in a fellow-being. If, then, we find any discrepancy between theory and practice, let us not hasten to put the *ego* upon the throne, and consign the theorist, with his theory, to eternal perdition. The errors lie oftener on the side of practice than on the side of theory. The man who devotes a great deal of his time to pure theory is certainly more likely to be correct than the practitioner who has no time to give to pure theory as such.

Theory and practice must go hand in hand, mutually helping each other. We could not separate them if we would. An important lesson for all to learn is, in case we find any discrepancy between our practice and somebody else's practice, to always look for the errors at home before we charge them to others.

Billings' New Surface Gauge.

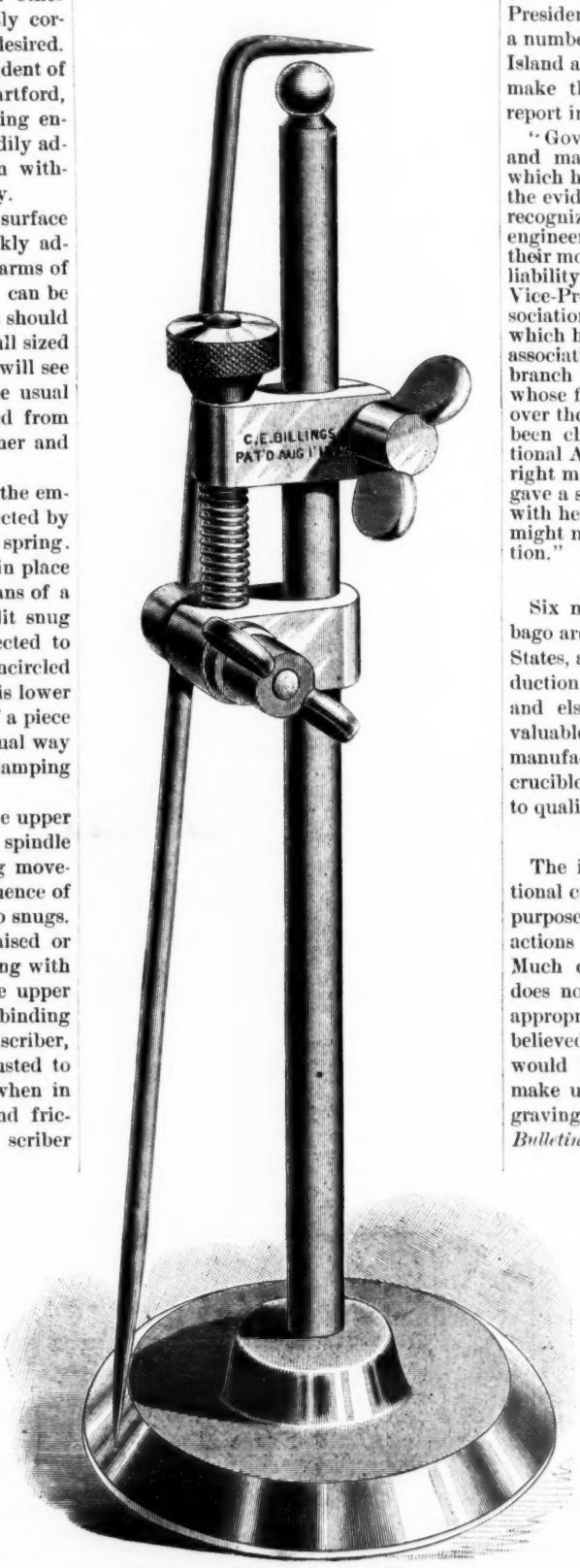
In adjusting the scriber upon the ordinary surface gauge it is customary to set it approximately by the thumb screw, then knock it gently with a bit of wire or other convenient implement until it exactly corresponds with the lines or surfaces desired. The invention of C. E. Billings, President of the Billings & Spencer Company, Hartford, Conn., as shown in the accompanying engraving, enables the mechanic to readily adjust the scriber in any desired position without any vexation or unnecessary delay.

The fact is that the scriber upon a surface guage should be as easily and quickly adjusted with equal precision with the arms of a pair of spring calipers, and there can be no satisfactory reason given why this should not be so. By an inspection of the full sized accompanying engraving, the reader will see that the base and spindle are of the usual form, both of which are drop forged from bar steel, finished in a thorough manner and hardened.

The chief improvement consists in the employment of two sliding snugs, connected by a screw encircled by an open spiral spring. The upper snug is split, and is held in place at any position on the spindle by means of a simple thumb nut that clamps the split snug on the standard. This snug is connected to the one below by means of a screw encircled by an open spiral wire spring. This lower snug carries the scriber, consisting of a piece of steel wire, which is held in the usual way by means of a thumb nut on a clamping screw.

In operation, any movement of the upper snug up, down, or around upon the spindle is accompanied by a corresponding movement of the lower snug, in consequence of the screw connection between the two snugs. The lower snug can, however, be raised or lowered by the connecting screw acting with the spiral spring, so that while the upper snug is held firmly in place by its binding screw, the lower snug, carrying the scriber, may be carefully and exactly adjusted to surface or point measurements, and when in position the tension of the spring and friction of the screw will hold the scriber exactly to such adjustment.

The advantages of this gauge are not confined to its close vertical adjustment after the principal snug is fixed as closely as possible to the surface to be gauged, but comprehend also a swinging around of the scriber to reach surfaces out of one direct line without disturbing the standard.



BILLINGS' NEW SURFACE GAUGE.

Damages in the sum of $10,000 was awarded by a circuit court jury last week at Clayton, Mo., in a cause in which Patrick Dowling sued Gerard B. Allen & Co. Dowling was an employe of defendants, and while at work in their foundry, by reason of defective machinery, met with an accident that resulted in his losing a leg. This case has been on the docket, we believe, for some ten years.—*Age of Steel.*

Artemus Ward's inspiration of an army composed entirely of brigadier generals is suggested in the organization of the Prussian State railways, which employ 63,787 "workmen" of every kind and 48,659 officers, or one officer to every 1⅓ men (or man, if you prefer).—*The Railway Age.*

As almost everything is said to move in cycles, it would seem that the country is at present in the midst of a boiler-explosion cycle. The accounts from all quarters materially help the daily papers to fill up.

Some Scientific Questions.

It is a mooted question with some people as to how much or how little is included in the term "Science," or "Scientific." By many it is supposed to embrace almost all forms of exalted knowledge not possessed by the common herd. Media, Pa., has a debating club which rejoices in the name of the "Institute of Science." The members of that institute seem to give a very broad interpretation of the word "Science," if we may judge by the report of its recent meetings appearing in the local newspaper, the *Delaware County American*. We make the following extract from the proceedings:

"E. J. Dwyer elaborated upon the propriety of annexing Canada to the United States, and showed that country's adaptation in point of fauna and ferna, climate and geographical outline, to become a part of the Union. Lewis S. Hough expressed surprise that the gentleman's treatise on annexation had left Mexico out in the cold. He thought the desirability of making the acquisition had been demonstrated by the purchase of Louisiana, and pronounced a glowing eulogy on Thomas Jefferson as the potent exponent of Yankee Doodle. H. C. Snowden and James Sheen opposed annexation, the former because we have already enough dead stock in real estate on our hands, and the latter because he believed the people of portions of the countries in question were not willing for the change. John B. Robinson argued against annexation, saying that the reasons that made Louisiana a profitable purchase would not apply to Mexico and Canada. Joseph Chadwick also opposed the proposition on utilitarian grounds."

Such momentous questions have not even engaged the attention of Congress since its recent assembling, but then Congress does not claim to be a "Scientific" body.

The Rhode Island Engineer Association celebrated its third anniversary December 16, 1882, by holding a concert and reception to its friends. The chairman of the Committee of Arrangements was Henry D. Cozens, President of the National Association. Quite a number of the prominent citizens of Rhode Island and Massachusetts were present. We make the following brief extract from a report in the *Providence Journal:*

"Governor Littlefield was first announced, and made a brief, appropriate speech, in which he complimented the association upon the evidences of its growth and prosperity, recognized the importance of the duty of the engineer, and urged the members to stand by their motto of 'Temperance, honesty and reliability.' The closing speech was made by Vice-President Barker, of the National Association, and he made a stirring address, in which he ably set forth the principles of the association, congratulated the Rhode Island branch in having in its membership men whose fame as engine builders had extended over the civilized world, and one who had been chosen as presiding officer of the National Association, believing that he was the right man in the right place. In closing, he gave a sentiment that the city of Providence, with her wealth of manufacturing industries, might not overlook her Engineers' Association."

Six million pounds of graphite or plumbago are annually imported into the United States, and it is estimated that the home production in New York, Pennsylvania, Canada and elsewhere equals this amount. This valuable material is used principally in the manufacture of lead pencils, stove polish and crucibles. Its market price varies, according to quality, from $25 to $75 per ton.

The issuing of a limited amount of fractional currency, redeemable in silver, for the purpose, chiefly, of facilitating small transactions by mail is again being discussed. Much can be said in its favor. The law does not forbid it; all that is needed is an appropriation to pay for new plates. It is believed that of this kind of currency enough would be lost or destroyed to more than make up to the Government the cost of engraving and printing.—*Boston Commercial Bulletin.*

The machinery building establishments in England are unusually busy. Orders for heavy machines have to be placed several months ahead. Something of a "boom" has apparently struck the English engineering trades. The British iron and steel markets, on the other hand, are quite dull. Judging from the expressions in our English exchanges great anxiety and hopefulness, in regard to a revision of our protective tariff, exist on the other side of the Atlantic. They admit, however, that the prospect of a revision in the interests of foreign manufacturers is not very bright.

L. Sterne & Co., of Glasgow, in their new works for the manufacture of gas engines and feed-water heaters, at Hollinwood, near Manchester, England, have introduced the American system of working hours, viz., seven to twelve o'clock in the forenoon, and one to six o'clock in the afternoon, except Saturdays. The system previously in use required work to begin at six o'clock in the morning, with an intermission of one hour for breakfast, between nine and ten o'clock in the forenoon.

The Cincinnati Exposition for 1883 will open on Wednesday, September 5th, and close on Saturday, October 6th.

Mechanical Drawing.

BY PROF. JOHN E. SWEET.

It is possible for one not far advanced in drawing to fairly work out a tolerably complicated machine by separating it into parts, studying and drawing each part independent of all other parts. A good machine to experiment upon for this kind of practice is found in the lathe for turning iron. This may be divided into four general parts, neither having much connection with the other; that is, the bed or frame of an ordinary lathe might be supplied with any kind of head stock, foot stock or slide rest, regardless of its own shape or support.

As this simple piece of machnie designing has occupied the attention of the most of our best machine-tool builders, and as some of the old ones are changing their designs, and as new departures are being introduced by new concerns, it is a subject well worth any machinist's study. The apprentice may well think up the subject and so be prepared to judge fairly of their merits when the new features stare him in the face. As there are probably as many 16′′ lathes (that is lathes that will turn a 16′′ wheel), in the country as those of all other kinds put together, it will be as well to select a lathe of about that size to make drawings from.

The oldest lathe the apprentice is likely to find, in which the bed or frame and legs are of cast iron, may be something like that shown in Fig. 51; although many possess a vast deal more of architectural display in the way of moulded bed and ornamental support. While the making of drawings of ornamental machinery may be good practice, so far as the making of a draughtsman is concerned, it will be the worst of all practice if the apprentice wishes to skill himself in designing, or even if he only expects to go far enough to learn what is good or bad in machine construction. It may not be pertinent to argue just why a sewing machine may be made ornamental and why a machine tool should not be so made, but the apprentice might as well accept it as a fact that the best tool builders do not cover their work with ornaments, and leave for the hereafter to learn just why they do not.

It will be seen that the legs or supports shown in Fig. 51 are set in from the ends of the bed, and while this is correct, and looks all right at the foot stock, or right hand end of the bed, it does not look right at the other end, as the head stock appears unsupported.

The English plan, and the one followed by nearly all modern builders, is to set the supports at the end. One style of English support is shown in Fig 52, which is in part copied by the Philadelphia builders, as shown in Fig. 53.

The New England builders follow out the plan of spreading out the supports in both directions, as in Fig. 54, and at times some firms experimented with the plan of putting a stunted column at each end, as in Fig. 55, using the columns as tool boxes.

Let each apprentice select for himself a lathe from which to make a drawing, and the chances are ten to one that he will select the New England lathe, for just that unexplainable reason that every new lathe builder who goes into the business without a thought except as to what will sell, drops on to the Yankee lathe directly.

As there is no danger of a lathe turning over endwise, there is no reason why the supports should stand out bracing, and there is this against the plan, that it adds to the lever arm, which tends to spring the bed down in the center.

Fig. 56 is a sketch made from a verbal description given of something to be brought out as an improvement on the New England model. Just whether the swell under the bed is a strengthening device to counteract the lever tendency of the sprawling legs, or whether it is added as a weight to assist them in bending the bed, my informant did not seem to know.

Fig. 57 is reproduced from the AMERICAN MACHINIST, published some weeks ago. So far as the side view and three legs are concerned, it is identical with a lathe built some four years ago by Benj. F. Wilson, at Ithaca, N.Y. This is unquestionably a better position for the supports than either of the others, though for a parallel bed supported upon four legs, Fig. 58 shows the best position, both as regards looks and utility. But as a large majority of the lathes of this size and nearly all of smaller sizes, are set upon common shop floors, which are seldom true and always subject to change by varying load, the four-legged lathe must either be so rigid as to maintain its position regardless of its supports, or else be subject to change as the floor changes. The three legged plan shown in Fig. 57, page 5, obviates this difficulty, but possesses the defect that the lathe may be pretty easily upset. The same advantage is obtained, without the objection, in the way shown in Fig. 59, which is an end view of a foot lathe shown at the Centennial Exhibition. The two legs are cast together as usual, but are pivoted in a way that admits of some free play, so they can tilt to conform to an uneven floor without twisting the bed.

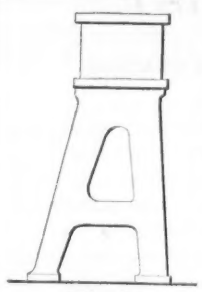


Fig.52

The same thing is shown in Fig. 60, which is from a lathe now being built by Prof. Charles G. King, of Madison, Wis. The position of the supports in this lathe is the same as shown in Fig. 58, but the enlargement of the bed, which was called for to accommodate a special screw-cutting device, led to the adoption of the tool-box support for the head-stock end.

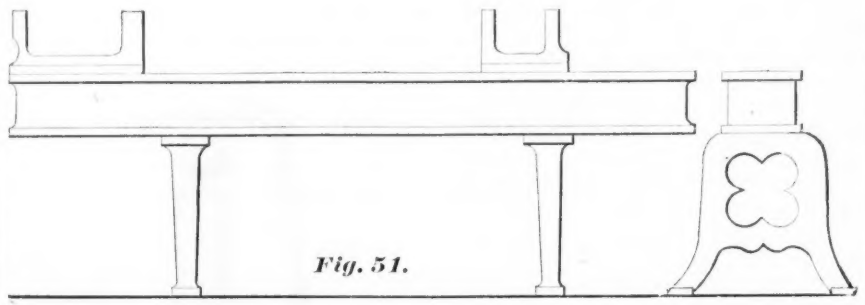


Fig. 51.

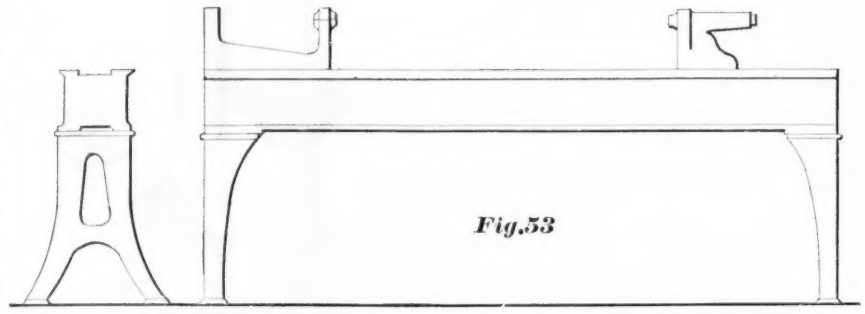


Fig.53

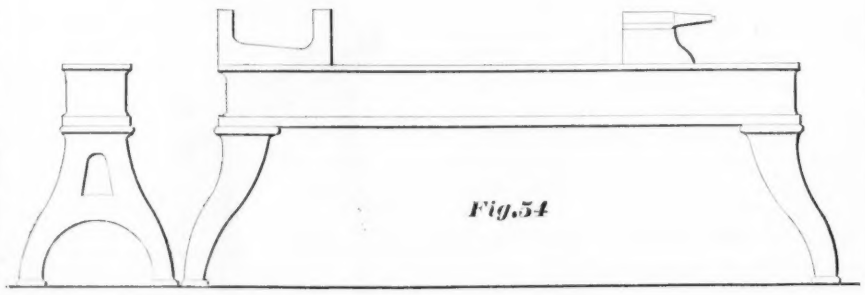


Fig.54

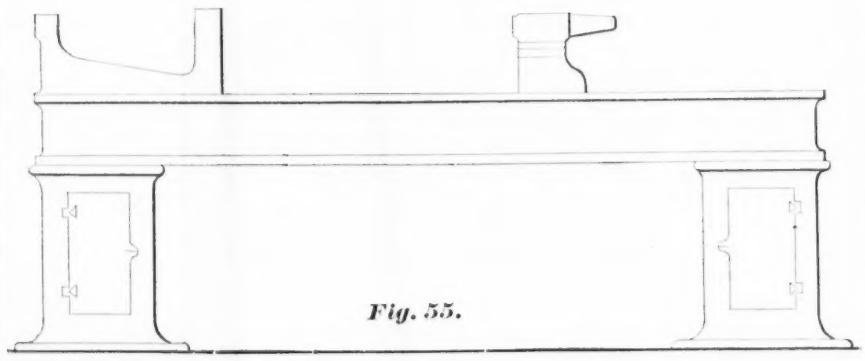


Fig. 55.

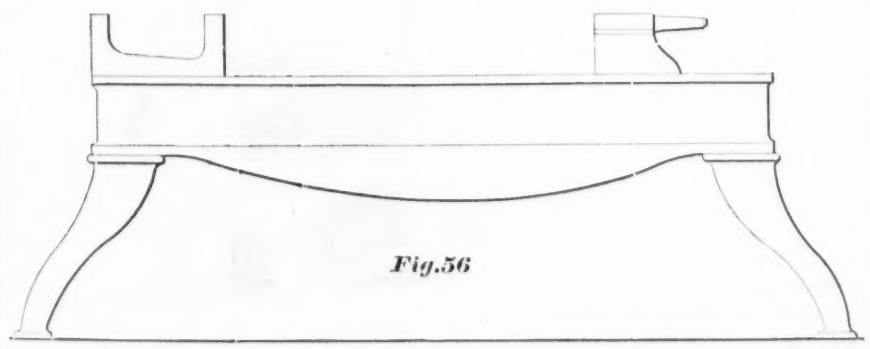


Fig.56

There has been an almost endless variety of designing of lathe legs, varying in all degrees from the ones shown in these sketches, but the standard tool builders of to-day nearly all copy pretty closely the two shown as the Philadelphia and New England designs.

The *O G* and reverse curve sort, shown in Figs. 51, 54 and 56 look outrageously ugly to the Philadelphia builders, and the straight down sort stiff and ugly to the Yankee. Why the straight sort looks all right to the Philadelphian when he is looking north and south, and why it has to turn out on a graceful curve for beauty's sake when he looks east and west; and why the obverse *O G* with circles for beauty in Fig. 51 looks all wrong, and the reverse *O G* with curves for beauty, looks all right to the New Englander, are among those things that the apprentice may expect to learn when he gets to be a journeyman. Why the straight arm in a pulley, if of a pleasing and appropriate form in cross-section, looks all right, and the straight support to a lathe, if also of a pleasing and appropriate cross-section, looks all wrong, must be from birth or education, for theoretically there is more reason why the straight support should be right, and look right, than there is why the pulley arm should be so constructed.

These questions of position and form of support are given as simple hints to the thoughts that have been and can be bestowed upon such a subject. The best form for the cross-section of bed, and the method of fixing the head-stock—guiding the foot-stock and the guides for the slide rest—are questions about which there has been an equal amount of study, and about which there is quite as great difference of opinion.

John Richards, who has given the subject a vast amount of thought, suggests that the bed should be cast with a bottom, to best prevent torsion. The lathe built by Mr. Wilson (referred to above) had a bed in the form of a half-round trough, or a U shape, which, to resist both spring and twist, was likely in better shape than any other—certainly better than the usual forms.

John Richards wrote, some years ago, a very strong and a thoroughly scientific article, showing that the best way to guide a slide rest was on two V ways. He has recently written an equally strong, but a good deal less scientific, article, to show that a flat bed, with a gibbed down guide, is the only correct thing.

It is very certain that the two V's work perfectly satisfactorily in certain places, and it is probably equally certain that the flat business works just as satisfactorily in other places; but why, and in what way, one large V in front and a flat way at the back will not do the work better and be cheaper than either the two V's or the flat top bed, is more than I have ever been able to find out.

The apprentice can take either of these sketches for making a drawing of a lathe; or, better yet, take some lathe to work from, referring to these sketches as hints as to one way to begin, and so work out for himself one of the best possible drawing lessons.

Jacquard, the inventor of the wonderful attachment to textile looms that bears his honored name, when summoned before Napoleon, was asked by Minister Carnot: "Are you the man who pretends to do what God Almighty cannot do—tie a knot in a straightened string?" "I do not do what God cannot do, but what he has taught me to do," modestly replied the artisan; and Napoleon was so pleased with him that he gave him a pension of 1,000 crowns; but that did not prevent his fellow-workmen breaking to pieces his invention in the market-place of Lyons, shortly afterwards.

Several iron and steel mills in Pittsburgh and the West have reduced the wages of their employes, by reason of dullness in the trade and consequent lower prices of the product. It is hoped that orders will be more active in the spring, and that selling prices and wages will be placed where they were in the early fall.

It is proposed to hold at Paris, next year, an exhibition of recently devised appliances for lessening the frequency and dangers of railroad accidents. To judge from experience, there is need enough of bringing such appliances into use; and, if the proposed exhibition results in the adoption of the unknown good ones, its value will be apparent. The opportunity to exhibit may be improved by inventors, who claim that, after working out something useful in this direction, they are unable to bring it to the attention of railroad officials—much less to secure a trial of its merits.

As an item showing rates of iron workers' wages in England, we take the following from the *Ironmonger :*

"Alderman Avery, President of the South Staffordshire Mill and Forge Wages Board, has made the following award in the application of the operatives for an advance of wages :—(1) That the wages paid to puddlers shall be 8*s.* per ton until December 31 next, being the existing rate of wages ; (2) that from and after December 31 next, to March 31, 1883, puddlers' wages shall be 8*s.* 3*d.* per ton ; (3) millmen's wages to be regulated by the above prices in the same manner as heretofore ; (4) that such rate of wages shall continue after March 31, 1883, unless it shall be determined by notice from either side of one month, which notice either side may give to terminate on March 31, 1883, or upon any subsequent date."

LETTERS FROM PRACTICAL MEN.

Making Plaster-Paris Following Boards.

Editor American Machinist :

In a recent issue I notice that a San Francisco correspondent is in want of information in regard to making plaster-paris following boards. In order to get good results from your plaster it is necessary to have a nicely parted and finished sand mould. The patterns should be well oiled all over the surface with good machinery oil, so the plaster will not stick. To have a nice surface it is a good plan to take a charcoal bag and shake on a good coating, and slick it down ; then put on your frame on small boards. Bore about 1 inch hole, put in a sprue or gate and raise it round about with sand. Use nothing but water to mix with, and only put in a small quantity of plaster-of-paris at a time, and mix it thoroughly. Pour it when it is about the thickness of cream. Keep the sprue full until it has entirely done shrinking and level it before taking off the pattern, one-half or three-quarters of an hour, and you will have a good board, which will be tough, and stand a great deal of wear.

FOREMAN MOULDER.

Old Time and Modern Machinists' Practice.

Editor American Machinist :

Allow me, as a machinist of twenty-five years' experience, fifteen of which I have spent in the construction of new machinery with apprentices, to take exception to some of the statements in the article headed "Defective Apprentice System."

In the first place, the writer says that in these days we have introduced new machinery, and put a man who was a workman to watch the machine, run by the workmen, thereby making him an operative.

As far as the manufacture of guns, pistols, sewing machines, and small hardware is concerned, this may be true; but as regards the manufacture of steam engines, flour and general mill work, or wood working machinery, the writer is very much at fault.

It requires the same skill to fit a coupling on a shaft, or to make a shrink fit for an engine crank, to-day, that it did thirty years ago, although to-day the job may be done on an improved lathe, where thirty years ago it was done on an old-fashioned chain lathe. If we have a large pulley to turn, what matters it whether we do it on the horizontal plate of a boring mill, or on the vertical plate of an engine lathe? The operation is practically the same, and the same amount of skill is necessary to do the job in either case.

We have substantially the same tools today that we had thirty years ago, only they are better made and have a wider range. Secondly: It is *not* true that machinists of today are incapable of doing the work of their predecessors.

The conventional machinist who comes round in the morning about 7 o'clock with a twisted scratch awl, a ball-pein hammer and more cheek than a lightning-rod agent, is no workman. He can turn up studs, chuck out collars, and do various other things, but put him to fitting or finishing in a vise, planing dove-tails, or fitting tapers, and if he does a creditable job in a moderately short time, he is ahead of most of the so-called machinists.

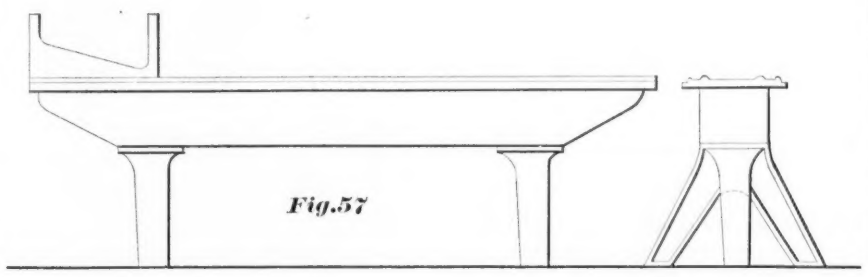


Fig.57

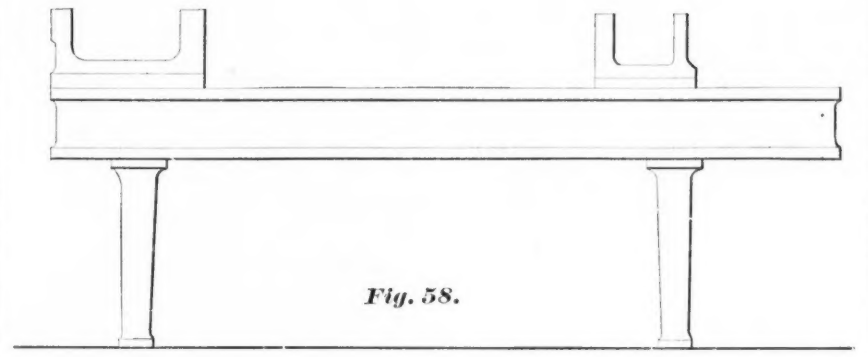


Fig. 58.

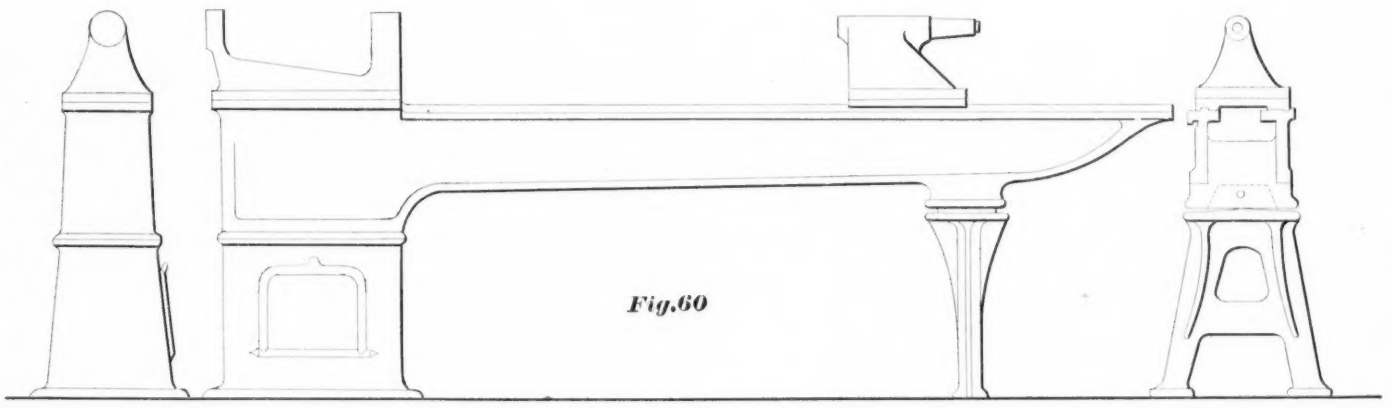


Fig.60

On the other hand, go into the large shops and take the best men—first-class men, who do first-class work, and to whom the concern pays first-class wages, rather than let them go—and you will find that these men resemble the old-time workmen about as much as the Knowles loom of to-day resembles the weaving machine that the old-timers built.

How many of your old-timers can make a drive or running fit without the use of a file? In my shop I have twenty boys who do this thing right along with a smooth cutting-tool and soda-water.

Can your old-timer make a running or drive fit? Oh, yes! He turns down to within $\frac{1}{64}$″ of size, and then speeds up his lathe, and files, and by the time he has spent a half hour filing and reducing the journal so that it resembles a hex. nut, he has a "fit," driving or running, as he desired. Give him a casting with a hole say, 6″ deep and 2″ diameter, to bore out. He chucks it and proceeds to bore it out with an elegant-shaped tool which resembles anything except what a tool should be like which is intended to do any cutting duty, and in the course of time has a taper hole through it, correct to size, at the large end, may be. You take a chuck drill and show him the beauties of the same combined with the rest and monkey-wrench, and put a clean, true hole through in ten minutes, but he don't or won't see anything notable in it. The old-fashioned machinist was very good in his place, but the world has got ahead of him, and it is time for him to pass out of the mechanical arena.

Thirdly: "Fathers see that there is not the chance for their boys to learn the machinist's trade that there was twenty years ago." Now, the fact is, good American boys who are willing to learn the machinist's trade, or in fact *any* trade, cannot readily be found, be the chance offered them ever so good. When such a boy is found he fails to see why he cannot find a shop where he will learn more in two years than apprentices twenty years ago would have learned in seven years.

Cambridgeport, Mass. L. M. C.

Machine Tool Notes.

Editor American Machinist :

From the discussions on machine construc-

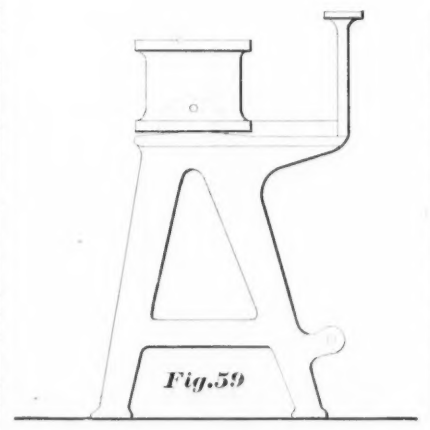


Fig.59

tion that have been going on in your columns lately, it would appear that "extremes meet." One correspondent advocates $7\frac{1}{2}$″ spindles for 20″ lathes, while another tells of a manufacturer who makes 26″ swing lathes only intended for 3′ or 4″ work.

Oberlin Smith thinks the superior construction of the milling machine and shaping machine is due to having a short pedigree, and the defects of many lathes from being descended from the hand lathe. There may be something in that, but the old hand lathe fast headstock was not made hollow. I recollect a 36″ moodna lathe came into a shop where I was working in 1856, and so completely ignorant were the men of the English type of headstocks, that they remarked, "there is a good deal of the old hand lathe in its construction."

Whitworth had a double-headed, double face-plate, wheel lathe at the World's Exhibition in 1853, at New York, which I believe was the first in this country. It was quickly copied, but modified—that is, made more on the skeleton principle.

We have an old wheel-lathe here, with originally one rest, a tolerably good headstock, face-plate and spindles ; but it is shockingly deficient in the shears. The shears have no cross-ribs or girders. The consequence is, they can be sprung and spread by driving wedges where the tail-stock ought to fit. At a casual glance the lathe looks powerful and massive, with highly-polished oil-cups, etc. The idea of fancy ornaments on a machine, with such weak under-pinning, is bad. The cross-feed slides are down level with the shears, so that the cutting edge of the tool and the sliding part are a great distance apart, causing the tool to dodge out and in over the lumps and holes.

I think the duplex system of slide rests will come more into general use for such work as boring and turning tire, heavy shafting, etc. A coarser feed could be used, and one cut would do for some jobs. The strongest opponents of heavy tools are workmen who have been brought up on the opposite kind, and have been used to taking light cuts with sharp pointed tools, and a feed of 100 to the inch.

I should like to see the history of the lathe illustrated. I have seen an old hand-lathe, said to have been made in the last century. The dead spindle was square, and the cone of the fast headstock was the wrong way about. I believe the first back geared lathes that were made had two sets of cones. The one on the spindle was keyed fast to it, and the other was keyed on the back-gear shaft. The belt was unbuckled and put on the back cone when the gear was used. I have seen two made in that way, that bore the date of 1818. Roberts claimed to have invented a planing machine in 1814, but it was proved they had one working in Derby in 1811.

I like the American plan of putting machinists on planing machines. In England and France a planer hand is generally a promoted helper, or a man who does nothing else, and his wages are considerably lower than fitters, turners, or erectors. He is not considered eligible to join the club.

It is just as easy to feed fine on a stiff lathe as on a slim one. On the former, if powerfully geared, the first cut can be taken nearly down to the size, and if a flat tool with a coarse feed is desired for the finish there will be no chattering. Of course, for a light jobbing lathe, where there is much shifting and changing and no heavy cutting, the handy light one has its uses.

I was glad to see the engraving of the English planing machine in the issue of December 16th, also some remarks on the apprentice system. J. K. C.

Base Lines and Planer Head Graduations.

Editor American Machinist :

I noticed in your issue of Dec. 16, an article by Geo. H. Smith, about protractors and graduations on planer heads, in which he expressed a wish to hear from others, for mutual benefit. Now I like to learn all I can, and will do all I can to help others. I quite agree with him in some points, but in others I do not. I consider the base line to be, properly, horizontal, which I think to be right. If a draughtsman marks his work with base line horizontal, the mechanic has no right to turn his work a quarter way round and then say the draughtsman is not right. Let us take sketch *B.* I claim that the protractor is not applied to the work correctly; as the "boys" say, "it is not

square with the world," When you get a spirit level adjusted it indicates level, and you have a base line. I have considered the axis of the earth the base, and East, or where the sun rises, as 0, and the North pole 90°. West, where the sun sets, is 180°, etc. When I speak of the base, it always appears to me as level with the earth.

I made a drawing of a miter gear wheel, and gave it to the foreman of the machine room to cut the teeth. I forget whether I marked the degrees of the bottom of the tooth or not; at any rate when they came to set the machine and cut one tooth they saw it was not coming right, and the foreman said he had never had any experience in cutting bevel gears. He was an intelligent man, and read a great deal; so instead of guessing at it, he sat down to see the whys and wherefores, which resulted in bringing three or four of us together, and a discussion at some length of the protractor, and the graduations on planers and milling machines. By the way, this machine was a Brown & Sharpe universal milling machine, and I want to say right here, that I think it is graduated properly, at least I have never failed to make it correspond with the protractor when used, as I have previously mentioned.

Now I will show you how men get into trouble over a trifling thing.

We will suppose I make a drawing of a bevel gear, with base horizontal through the axis, and mark the angle 41°. We give it to a man to make, and he puts it on the machine, sets the head up 41°, and is all right. But suppose I do not mark it (the drawing), and he uses his protractor to find the degrees for himself, and assumes the base line to be vertical or at right angles to the axis. He will have 49°, which, if he sets the machine to, it will be wrong. I think Mr. Smith quite right in regard to the man's getting floored. All it requires is a little study; "be sure you are right, then go ahead."

I beg leave to criticise Mr. Smith's mode of applying the protractor to the sketches *B* and *D* in his article. *B* is 50° and *C* 40°, and the planer is graduated wrong, that is, the graduations are numbered wrong.

Cleveland, O. JNO. M. WEBSTER.

Scale for the Weight of Round Iron.

Editor American Machinist:

I am a reader of your paper and take great interest in it, especially in such articles as shop kinks, handy tools, etc. As you invite correspondence on such subjects, I will send you drawing and description of a tool I have had in use some years, finding it convenient many times. It consists of a graduated rule for showing the weight of round iron, pipe, etc., by measuring the diameter and multiplying by the length in inches.

The edge of rule represented at *D, E, F, G,* is graduated as a weight scale; the opposite edge to U. S. standard feet and inches, to measure the length of the piece which is being estimated. The diameters represented by the graduating marks *D, E, F, G,* etc., correspond to a piece of iron 1 inch long.

For example: Take a piece of iron in diameter equal to the distance from end of rule to first mark; *D* (1 inch long), will weigh 1 ounce; to *E* will weigh 4 ounces; to *F* 8 oz., and to *G* 1 lb. Multiplying this by the length in inches gives the total weight.

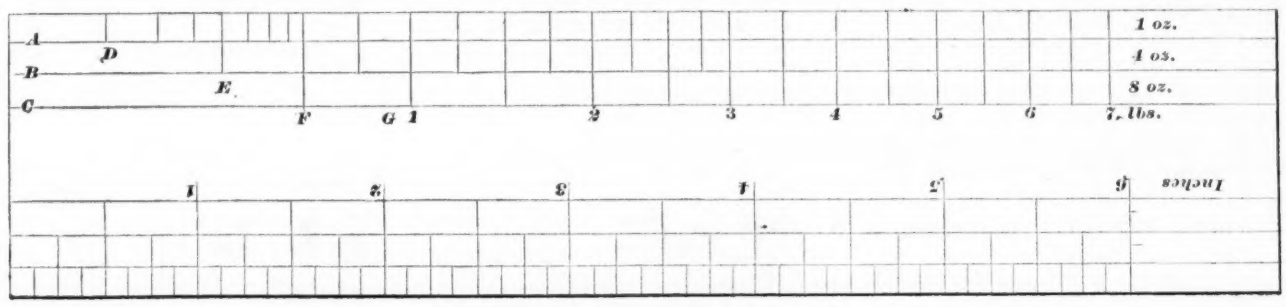
The graduating marks stopping on parallel line *A* show an advance of one oz. in weight, *B* 4 oz., *C* 8 oz. Those crossing below *G* 1 lb. As the diameter increases the space between graduating marks decreases, to represent an equal advance in weight. If graduated to ounces, in a little space they run together; therefore I skip (when they become fine as is practicable) from oz. graduations to ¼ lb., and so on to 1½ lb., 1 lb., etc. It will be seen that the 7 lb. mark falls a little short of 6 inches, making a piece 6 in. diameter to weigh slightly over 7 lbs.

If a hollow cylinder, or pipe, the diameter of the bore subtracted, gives the weight.

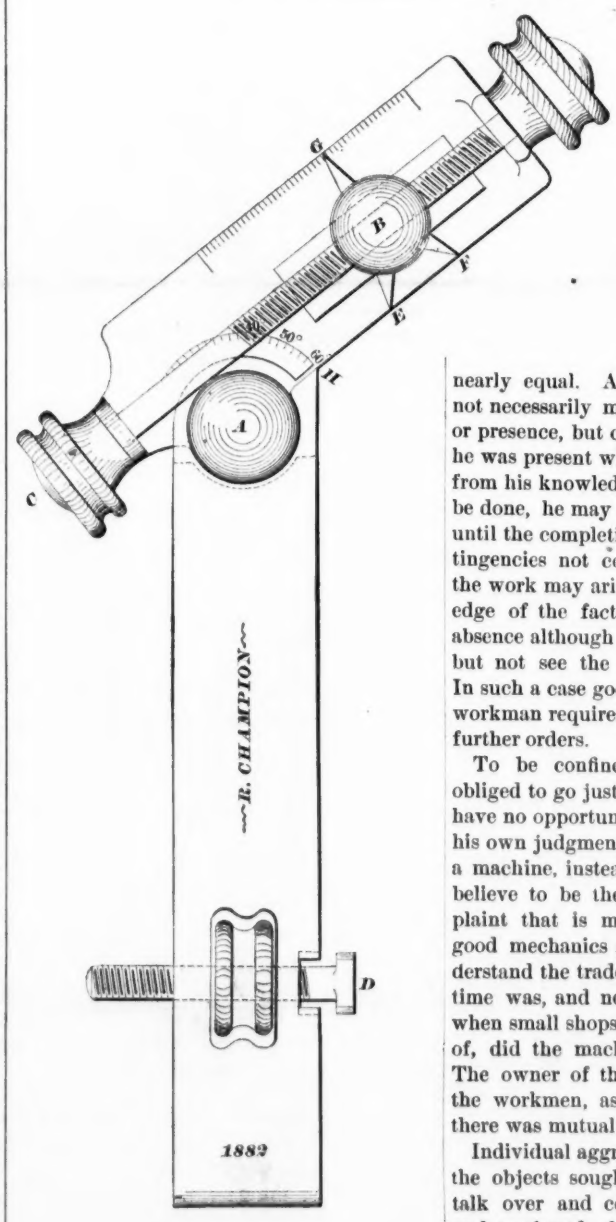
It is true that rules and tables may be found in books for the purpose; but, for instance, the practical workman is busy some day, and a party comes in with a rush, and orders patterns for a number of window balances of a certain specified weight. A heat is to be taken that day, and the party is anxious to get them in. It might be anything but agreeable to lose time to hunt up books, and go through the necessary operations to get at the desired result. I have never seen another tool of this kind, but designed this to meet my own wants.

As concluding evidence of its utility, I will mention a circumstance that occurred a short time since. I had occasion to buy a piece of 1¼" round iron of a neighbor, for a special job. I took the rule along, as scales were not at hand. The piece was procured. I laid the rule on and found it indicated 18½ lbs. My neighbor found his tables, and said it would weigh 59 lbs. I told him he was wrong. Another operation with the tables brought the weight down to 8 lbs., but I insisted that was not right, and, being in a hurry, went home. He came in shortly, and said 18¾ lbs. were the true figures, which I accepted.

C. WING.



SCALE FOR THE WEIGHT OF ROUND IRON.



Drill Gauge.

Editor American Machinist:

In some shops, not equipped with a modern drill grinding apparatus, and where the machinist wishes to know just what size of hole he is going to drill, a bevel gauge like the sketch may not come amiss. Its construction and operation will be understood at a glance. The blade is pivoted to the handle at *A*, and can be set at any angle suitable for the drill in hand to suit a given pin, and under such circumstances it becomes important to have a drill properly ground. Besides this, a drill will wear better when the work is evenly distributed on it, and will save time in fitting up.

By graduating the blade to degrees and using the pointer *H*, the drill can be ground to a given angle; otherwise it is proposed to adjust the gauge to suit the angle of the drill on one side or the other, and then grind both alike. BUZ.

Working to Order.

Editor Am. Machinist:

"Obey orders if you break owners," is a rule which in the absence of the owner should have considerable flexibility, and be chiefly used in solving doubts that may arise in the progress of the work, when the reasons for and against a certain course are nearly equal. Absence and presence may not necessarily mean actual bodily absence or presence, but constructively so. That is, he was present when he gave the order, and from his knowledge of what is purposed to be done, he may be supposed to be present until the completion of the work. But contingencies not contemplated, and affecting the work may arise, and his want of knowledge of the facts would be equivalent to absence although he might be bodily present, but not see the change in circumstances. In such a case good faith on the part of the workman requires a halt for council, and for further orders.

To be confined by strict rules; to be obliged to go just so far and no farther, and have no opportunity for the exercise of his his own judgment, brings a man to be like a machine, instead of a mechanic. This I believe to be the cause of the great complaint that is made about the decline of good mechanics; men who thoroughly understand the trade, as in former times. The time was, and not so very long ago either, when small shops, with no red tape to speak of, did the machine work of the country. The owner of the shop had grown up with the workmen, as one of their number, and there was mutual confidence between them.

Individual aggrandizement was not one of the objects sought, and they were free to talk over and council together, employer and employed, about the best ways of doing work. The workman took a job in the rough, and did all the fitting and finishing that was to be done to that piece, whether it was an engine cylinder, crosshead, or connecting rod, and often he did the work for the entire engine, or other machine, "solitary and alone." He took in the whole situation, saw all there was of it, and identified himself with the success of the work. He did not become what is now called a 'close workman," but he learned the relations of causes and effects, and saw how to adapt means to an end, with such degree of facility as is now almost wholly confined to the managers of work.

The present practice of strict orders and divisions and subdivisions of work turns out better work, and more of it per man, than was done in the days of small shops and full-fledged machinists. But with this plan thinking does not fall to the lot of the workman. He obeys orders, just as a planer platen does when the dogs are set, and that is all he has any chance to do.

The managers do the thinking, and, as it is the hardest part of the work, they are overburdened, and their minds naturally revert to the easy times that managers had in the olden time, and they sigh for old-time workmen to help them. Let them give to the men they have a chance to try their powers, by letting them work from general orders, and not dole out the work to them in special orders—down to every bolt, nut, pin and washer—and occasionally speak a word of encouragement for the exercise of forethought and skill, and better than the old-time workmen would soon be theirs. At first some mistakes would occur on the part of the workmen, and perhaps on the other side, but a little time would correct these things.

Technical schools would benefit mechanics if they were able to attend them, but the average journeyman cannot afford it. His school is the workshop, and the first problem is to earn his daily bread. Perhaps these schools are not intended for journeymen, but for employers only. If so, the curriculum ought to embrace a department to teach the best system of developing talent in the workshop. F. J. MASTEN.

Points in Building Engines.

Editor American Machinist:

Some builders of automatic engines fail to realize that the results obtained in the current working of their engines differ so little from those given by a good throttling engine that for some kinds of work the choice is a very narrow one indeed. In some cases the smaller liability to derangement generally found in the non-automatic engine, turns the scale, even when the economy likely to be reached in the use of the engine clearly lies the other way.

The real importance of this small fraction to the builder lies in the hint he should take as to the absolute necessity of so designing his engine, and so constructing it, that it shall not lose even this least fraction of advantage from any loss of its correctness of adjustment. Most men who have the daily care, even of the highest class of engines, are not equal to the task of discovering this loss of exact adjustment, and some are even less able to correct it when known.

It is doubtful whether it is correctness of design, or excellence of workmanship that has most to do in the maintenance of this close adjustment, when it has been once provided for in the building of the engine, but it is certain that neither can be safely neglected even in the smallest particular.

Elgin, Ill. P. BARNES.

Using a Table for Horse Powers.

Editor American Machinist:

Owing to press of business, I have not hitherto had time to reply to criticisms of Messrs. Odell and Bannatyne in a recent issue. The heading, "New Table of Indicated Horse Power, by W. A. Hammett," is

not correct. I did not claim the table as original with me, and did not put any heading upon it, or the examples showing its use. I had used it for some time, and found it very useful in computing the horse power; and, as several of my friends had asked me for a copy of it, I had some printed to give them. As for the correctness of this table, I think they will find it is more nearly correct than the average engineer measures his card; also, more accurate than the average springs are in the indicator. For example, if Mr. Bannatyne will take the numbers

7.486×40 M. E. P. $= 299.44$ horse power,
7.487×40 " $= 299.48$ "

or only a difference of $\frac{4}{100}$ horse power. Supposing him to make a mistake of only one-tenth of a pound in figuring his mean effective pressure, which we will call 39.9 M. E. P., instead of 40. M. E. P., then

7.487×39.9 M. E. P. $= 298.73$ horse power,
$299.48 - 298.73 = \frac{75}{100}$ "

or nearly nineteen times as much out of the way as the table of constants gave it; so, if he always figures as closely as the table, he will be pretty nearly correct.

The reason that there is not any allowance made for the piston rod in the table, is that the size of the rod varies so in proportion to the size of the cylinder with different makers that it would not be any more accurate to deduct any given percentage from the area of the pistons than it would to take them as they are.

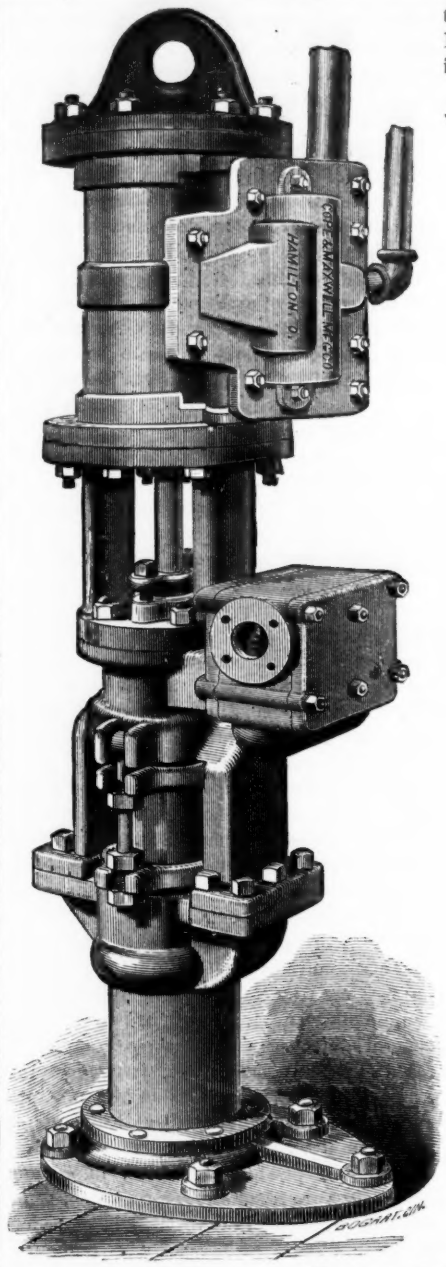
I think that the above explanation will clear Mr. Odell of his "constant" source of trouble, for, as I figure his constant, I find that, if he allows for a four-inch piston rod, he will get 10.136 for a constant, instead of 10.281, as it would be without allowing for the rod.

W. A. HAMMETT.

Boston, Mass.

Vertical Sinking Pump.

The accompanying engravings represent in elevation and section a steam pump for sinking and reclaiming mine shafts, manufactured by the Cope & Maxwell M'f'g Co., of Hamilton, Ohio. In using a pump of this class in sinking shafts, the pump must be lowered as the depth increases, and must be raised out of the way when it is necessary to resort to blasting; while in recovering shafts that have become filled with water, the pump must also be lowered from time to time to keep it within easy lifting distance of the water. Such pumps are also liable to



VERTICAL SINKING PUMP.

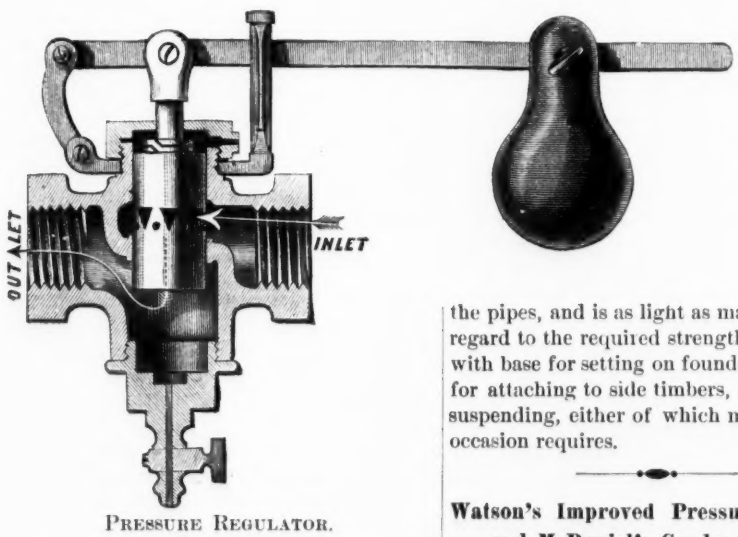
external injury; hence the necessity for compactness of structure, and the best available protection from injury.

The pump here shown is of the double-acting plunger type, with large water passages, and the working parts are encased and well protected from external injury. The plunger is packed from the outside, so as to be readily come at for adjustment while the pump is in operation.

The moving parts, that is, the piston, piston rod, plunger, &c., are made as light as is consistent with the necessary strength, which enables the pump to be run at high speed when it is found advisable.

The valve motion is simple and reliable, and so adjusted that the piston is gradually arrested at the termination of the stroke by a positive steam cushion, which further assists in rendering high speed practicable, and avoids the necessity for the excessive throttling sometimes resorted to.

This pump occupies only about the room in a shaft that is required for the cylinder and the pipes, and is as light as may be with due regard to the required strength. It is made with base for setting on foundation, brackets for attaching to side timbers, and hooks for suspending, either of which may be used as occasion requires.

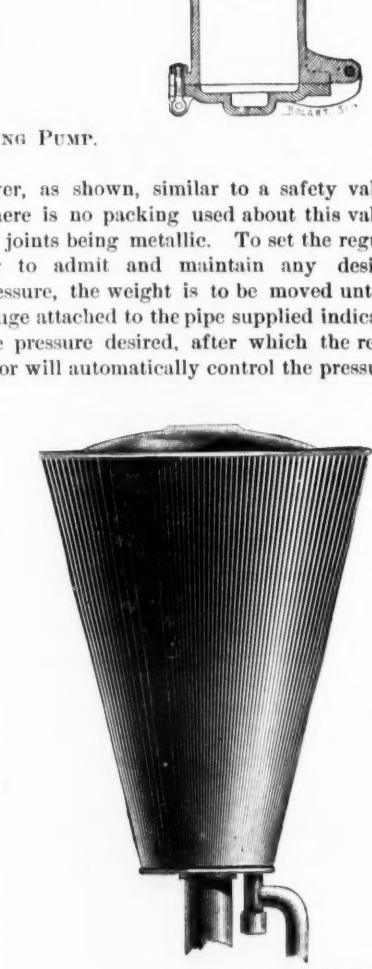


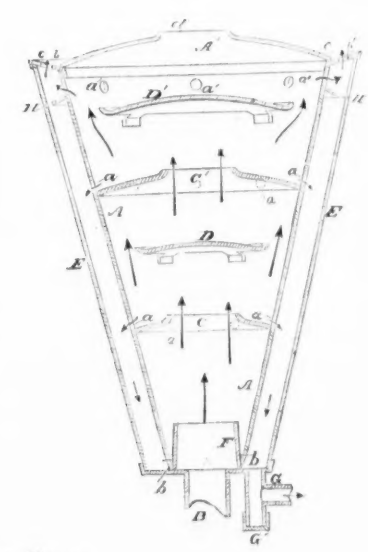
PRESSURE REGULATOR.

Watson's Improved Pressure Regulator and McDaniel's Condenser Head.

The pressure regulator shown in the accompanying engraving was designed to reduce the pressure of steam from that within the boiler and maintain any desired uniform pressure within pipes for supplying drying cylinders, evaporating pans, or for steam heating. This pressure regulator consists of a shell of brass in the smaller sizes, while those of two inches and upwards are of cast iron with brass lining. The shell is bored parallel like a cylinder to admit the valve. This valve has triangular shaped openings of a greater area than the pipe to which the valve is attached, so that whenever required, steam to the full capacity of the pipe can be admitted through the valve. By a peculiar construction of the body there is little danger of its getting out of shape.

A stem is attached to the top of the valve, being connected with a weighted lever, as shown, similar to a safety valve. There is no packing used about this valve, all joints being metallic. To set the regulator to admit and maintain any desired pressure, the weight is to be moved until a gauge attached to the pipe supplied indicates the pressure desired, after which the regulator will automatically control the pressure.





CONDENSER HEAD.

For marine purposes a coiled spring is used instead of the lever and weight, as weights and levers are subject to serious vibration in a heavy sea. It is best to use a gauge attached to the light side of the pipe to inspect the operation of the valve. The smaller sizes of these regulators are screwed to fit the standard pipe threads, while the larger sizes have flanges with bolts. The valve, when it becomes clogged or charged with sediment, may be readily cleaned by removing the valve and smoothing up with fine emery cloth. This regulator requires no lubrication whatever, except that which it gets from the steam; on the contrary, oily substances would seriously interfere with the working of the valve. Where boilers are used to run high pressure steam engines and low pressure radiators for heating buildings, a reducing valve is indispensable, likewise in breweries in operating steam jacketed kettles.

The condenser head for exhaust pipes from steam engines, shown by the other two accompanying engravings, is intended for preventing the disagreeable deposit of water on the roof and sidewalk. From the sectional view, it will be understood how this is accomplished. The iron shell *E, E,* firmly secured to the exhaust pipe *B,* has a connection *G* at the bottom, through which the water of condensation is discharged into a pipe leading to the waste. The exhaust steam, as it emerges from the aperture *F* passes into the case *A*, having a number of deflectors *C, C', D, D'*. These deflectors are dishing upward, with the highest part in the center. The steam escaping from the pipe *F* passes through the opening *C*, as shown by the arrows, striking the solid deflector *D*, by which the greater part of the water is thrown outward against the shell *A*, the water of condensation flowing through the holes *a, a*. The water that falls below the deflector flows outward at *b, b*, into the pipe *G*. After passing the deflector *D*, the steam has to pass through the center opening in deflector *C*, striking the deflector *D'*, finally escaping into the atmosphere at *d*. By the time the steam has performed all the necessary evolutions to make its exit at *d*, it has been pretty well broken up and the water extracted, so that practically nothing but steam escapes.

It will be observed that the top of the space between the two shells is inclosed by a perforated diaphragm *b'*. Below this diaphragm is a deflector *H*, to prevent steam from blowing up from below.

The steam escapes at the top so very slowly that it is readily absorbed by the atmosphere, and no water of any consequence is precipitated to freeze upon the sidewalk or steps, and thereby endanger the limbs of passers-by. If at any time water should accumulate between the jacket, so that violent ebullition ensues, it is prevented from escaping at the top by the deflector *H*. The cap upon the branch of the pipe *G* permits sediment, or any other dirt that may accumulate in the condenser, to be readily washed out. On account of the large cooling surface obtained by the double jacket, a large percentage of the steam is condensed. This water, in some localities, can be profitably utilized for washing or other mechanical purposes. By collecting this water in tanks, the oil would float at the top, while clean water could be drawn from a position near the bottom to be used for feeding boilers.

These condenser heads are made with shells riveted, or with joints bolted together, so that they may be taken apart for cleaning and repairs. They are made in nine different sizes to fit iron pipe from 2" to 16" in diameter.

These condenser heads, as well as the pressure regulator, are being introduced by James Beggs & Co., 9 Dey street, New York.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.

JACKSON BAILEY, Vice-Pres't.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, F. F. HEMENWAY, } Mechanical Engineers.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET, (Fleet Street), LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST at 16/8 per annum, postage prepaid.

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$4.00 to Foreign Countries, postage prepaid.

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NEW YORK, JAN. 6, 1883.

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The Outlook for Machinery.

After business has experienced an abnormal expansion for several months a slacking up to its normal volume and condition is likely to alarm some of the most skeptical, and in some cases induce them to husband their efforts and resources. The rush of orders for machinery has been considerably modified within the last few weeks, but there is no reason for serious apprehensions for the year 1883. Even with a depression in the iron trade (due largely to tariff reconstruction) and a slacking up in the building of new railroads, our machinery and tool manufacturers may reasonably expect a good trade. Almost every kind of productive industry depends largely upon machinery and should one or two branches be depressed, it will not necessarily cause serious dullness in the machinery business. Our department of "Manufactures" on page 9, presents as good an index of the rise and progress of establishments requiring considerable machinery equipments as we can conveniently lay before our readers, and they cannot have failed to notice that during the closings month of 1882 there was an increase rather than a diminution of new and extensive establishments going into business requiring full plants of machinery to carry on their works. Not many months ago it was almost impossible to secure machinery to equip and start a new manufactory within a time which appeared reasonable to the projectors of the enterprise. Even if the parties were willing to wait for their machinery until orders previously placed had been filled, prices were often asked that had the effect of determining the purchasers to delay placing orders until prices more favorable to them would be accepted. As it is now, there is little difficulty in having orders for machinery filled in good season and at prices reasonable both to seller and purchaser. An active demand exists for good tools and machines, and so far as we can learn, purchasers are not expecting or waiting for any material reduction of prices. Steam engine and boiler manufacturers are generally quite busy, and from present indications are likely to remain so for months to come, although they are not, as a rule, taking orders for delivery as far ahead as formerly.

Certain branches of the machinery business may become crowded as the result of too much competition. The remedy would seem to be greater flexibility in selecting the kind of machinery and tools to manufacture. If a shop finds a dull trade in its specialty, there should be no serious hindrance to adopting new specialties, either temporarily or permanently.

"Costing" Machine Work.

It is undoubtedly true that in Great Britain, and probably in other European manufacturing countries, a great deal more importance is attached to the determination of the exact cost of every detail of machine construction than in this country. The difference seems to be that there it is the rule to know the cost in detail, while here it is the exception; in fact, it is questionable if in any instance in this country the same or equivalent means are employed to that end that are employed in some shops there. In conversation recently with an engineer from Glasgow (Scotland), we were informed that at their works they have four men constantly employed in what they term "costing" the detail of their manufacture; that is in determining to the smallest detail what should be properly charged to every operation to which the various parts, and the machine as a whole, are subjected. To these four men a fifth is added, who records their observations in such a way that any part of the information that may be wanted can at once be come at in the office.

Every operation, whether of finishing the various parts, erecting, or moving the finished machine from one part of the works to another, in fact everything that calls for expenditure of time in the production of a machine is characterized by a number, so that all work done is represented by time against certain numbers. The duty of the four men referred to is to record from actual observation the time to be charged to each number, and of the fifth man to put the whole in available shape. This all costs, we are told, about $2,500 a year, and the saving is estimated at not less than four to five times that amount.

The services of five men would seem to represent a large outlay for the purpose named, but the result seems to be entirely satisfactory, and to fully sustain the wisdom of the plan. Undoubtedly, the best basis from which to work in cheapening the cost of any product is to know the exact cost of that product; and, since any cheapening of the whole must be accomplished by reducing the cost of the details, it is not the knowledge of the total cost so much as that of the parts that is essential. This knowledge it is difficult to obtain with precision, except by some such plan as the one indicated. Similarly, a knowledge, in a readily available form, of the cost of the parts each time they are constructed, counteracts any tendency to allow the cost of their production to become gradually increased.

Whether the plan in operation there would work as successfully here, where the shop relations are somewhat different, may be questioned; but the statement of the actual saving, from what would at first look like adding another element of cost, is at least suggestive of the importance of giving a good deal of attention to determining and recording in some way the cost of the items of machine construction, in connection with the general subject of machine shop economy.

It is probably not correct to estimate the expense of the five men, as in the instance cited, as extra expenditure—at least, not if any attempt whatever is made to ascertain the cost of production; since, in a shop where slips are filled out by the men, some time is always lost in doing it, and considerable time and no little energy is frequently expended by them in balancing items with the full returns, to say nothing of mistakes that detract from the value of the knowledge, by making it certain that it is inexact. This time is saved by the four men, while the fifth would, perhaps, be required in any event to calculate and compile the cost from the slips.

Limiting Passenger Rates.

The Railroad Commissioners of California adopted a resolution prescribing that no greater passenger rate than four cents a mile shall be charged by any railroad company operating in the State. The legislature of Texas has taken the same matter in hand and enacted that three cents a mile shall be the maximum passenger rate in that State. These rates would seem to give the railroad companies fair compensation, yet the railroad journals are making a great outcry about "hostile legislation," and checking the extension of new lines. It is asserted (and perhaps correctly), that some railroads cannot pay expenses under the prescribed limit of fares. Special concessions might be made to some roads for a limited time, but as the object of legislation is to secure the greatest good to the greatest number, it is an important question of public policy whether railroad enterprises that will not prove remunerative under a fair schedule of rates should be fostered by legislation at the expense of the people. It is even more questionable whether all the railroads of a large State should be permitted to demand such rates as are needed to maintain in operation the least patronized road within its limits. At three cents a mile it would cost something over thirty dollars for a ride across the State of Texas. When we take into account the fact that every railroad in Texas is entitled free to a large tract of public land for every mile built, and that the State is mostly level, it would seem as though the roads ought to worry along on three cents a mile for every passenger, without serious distress.

Balance the Wheels and Handles.

One of the most aggravating things in the experience of a lathe hand is after starting a fine-cut and running a short distance to suddenly discover that the cutting tool has moved, owing to the turning of the unbalanced handle upon the end of the screw for operating the tool post. The workman under these circumstances has to stick in a wrench or hang on a bit of old iron to keep the handle from moving. We have seen some very fine lathes that had this small, but very serious fault of unbalanced handles. Some of these small features, although of very great importance, do not seem to be at all appreciated by some machine tool builders. It costs no more to accurately balance the wheels and handles for operating tool-posts and lathe carriages than it does to leave them several ounces out of balance. Upon boring mills and other machinery, we have seen work "botched," and in several instances spoilt, by reason of unbalanced wheels and handles suddenly moving while taking a finishing cut. Another serious fault in some lathes is the fact that so much weight is placed upon the apron that the back end is lifted from the ways. We saw a lathe not long since upon which the workman was endeavoring to take a finishing cut. The tool would cut very nicely for a few inches, when it would suddenly dig into the work, making terrible havoc with the finished surface. A few moments' consideration convinced us what was the matter, and we suggested that a block of iron be placed upon the back end of the carriage. This was done, after which the finishing cut was completed without further difficulty. The trouble was, that the weight of the apron, with its appurtenances, was enough greater than the carriage to overbalance it so that the back end was lifted as far as the small space between the gib and underside of the ways would permit, which caused the tool to dig. After sufficient weight was applied to hold it down, the tool necessarily worked smooth.

In the endeavor to accomplish some great improvement in machine tools, the small, but very essential details are often overlooked.

A late issue of a so-called "mechanical" journal cribs entire an article lately published in our columns from the pen of F. F. Hemenway, entitled "Balance Wheel for Inventors," while the next column on the same page cribs an editorial article published in our columns nearly a year ago, entitled "The True Value of Mechanical Skill," crediting it to *Exchange*. If it were worth while we would suggest to our contemporary, that the practice of crediting copied articles to *Exchange* is the meanest of all journalistic steals, and very damaging to the editorial conscience, if not detrimental to the edge of the editorial scissors.

We receive frequently from correspondents who ask questions through the columns devoted to that purpose, an especial request that we use some other than the initials of their names in answering their queries. To all such we would say: You can use whatever initials, or *nom de plume* you may select, but unless indicated to the contrary we use the initials of the writer's name. We would also take this occasion to repeat, again, that we must in every instance be furnished with the full name of our correspondents, as an evidence of good faith on their part. We consign, every week, a number of questions to the waste basket simply because we do not know who asks them.

It is proposed to hold an exhibition in Philadelphia of the progress and products of modern electric engineering under the auspices of the Philadelphia Engineers' Club. The project is a good one and we hope it will be carried out. The rapidly increasing use of electric lighting and other electrical appliances has made it necessary to have special electrical engineers.

Literary Notes.

THE THEORY OF THE GAS ENGINE. By Dugald Clerk. Reprinted from *Van Nostrand's Magazine*. Price, 50 cts. Published by D. Van Nostrand, 23 Murray street, New York.

This little book constitutes No. 62, of Van Nostrand's Science Series. The author has endeavored in his esssay to set forth by the aid of diagrams and other illustrations the true advantages of gas engines, giving a retrospect of what has hertofore been done in that direction by the most prominent inventors. The workings of the several classes seem to have been fairly treated. The discussion of this essay that also forms a part of the book is very instructive, as it embodies a consideration of the best proportion for mixing gas with air for use in gas engines.

The National Association of Stationary Engineers have issued a pamphlet giving the proceedings of the meeting for organization, held in New York, October 25th and 26th, 1882; also the constitution of the society. It will be mailed to any engineer upon application to Henry D. Cozens, President, Providence, R. I., or to A. M. Davy, Secretary, Detroit, Mich.

We quote from their constitution:

ARTICLE IV. This association shall at no time be used for the furtherance of *strikes*, or in any way interfering between its members and their employers in regard to wages, recognizing an identity of interests between employer and employe, not countenancing any project or enterprise that will interfere with perfect harmony between them; neither shall it at any time be used for political or religious purposes.

ARTICLE V. The National Association of Stationary Engineers shall consist of one delegate from each of the different associations, either grand or subordinate, elected for the term of one year.

ARTICLE VI. This association may grant charters upon the written application of ten stationary engineers on the payment of $10, and no charter will be granted to the second association in any city unless the members of the first association consent.

Questions & Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(1) C. A. B., Lansing, Mich., asks: Can you tell me of some shop or shops in Brazil where a machinist can find employment? *A.*—We are unacquainted with the matter, and cannot advise any one to look for work there.

(2) D. E. S., Philadelphia, Pa., writes: I frequently have drawings of mouldings [in wood] sent me with an order. I should like to ask some of your readers who have had practical experience of this kind, the best way to make a set of cutters from the drawing, for such work?

(3) J. J., Mt. Vernon, Ohio, asks: Will you tell me of some book on moulding from which I can get a knowledge of how to measure ladles and to find the weight of castings by measurement of patterns? *A.*—This information, and much more of a practical nature in regard to foundry matters, has been appearing during the past two years in a series of articles by Thomas D. West, which with some additions, has recently been brought out in book form by John Wiley & Sons, 15 Astor Place, New York.

(4) J. D. H., Savannah, Ga., writes: In your column of questions and answers, Dec. 23, you reply to a correspondent who asks, "Is it best to use a mud drum on the boiler?" "We should say no." Do your objections to mud drums apply to boilers generally, and if so, please state your objections? *A.*—We believe, on general principles, that when a boiler is properly constructed there is no occasion for a mud drum, and furthermore that they are generally neglected and always subject to corrosion, and liable at almost any time to cause a serious accident.

(5) W. J. S., Salt Lake City, U. T., writes: I have just put up some boilers, hoisting machinery, pumps, &c., at the Emma Mine. The engines are 1800 feet from the boilers, yet we can only detect a difference in pressure of one pound in the pipe at the boiler and at the engines. The pressure carried is 80 lbs. Is this an unusual distance from boilers to engines, and is the fall in pressure unusually small? *A.*—The distance is great, and particularly the fall in pressure is so slight as to suggest that you have made an error in your observations, that is, if as we suppose, you make your observations when the engines are at work.

(6) D. J., West Milton, Ohio, asks: 1. What speed should a hand lathe for turning wood run, with the belt on the fastest speed? *A.*—It depends on a good many circumstances, as the size of lathe and the condition of spindles and bearings, &c. They are very seldom speeded fast enough. If a medium sized lathe of good construction, you can probably run it 3,000 revolutions per minute. 2. Is a surface blow-off of any use, and if so, where should it be attached? *A.*—A surface blow-off is in many cases useful, and should be attached so as to blow from the surface of the water. 3. How large a one should be used for a 10-horse boiler? *A.*—One inch will do very well.

(7) A. E. B., Cleveland, Ohio, asks: 1. What is the proper rule for ascertaining the circle and the length of an engine reversing link? *A.*—We suppose you refer to the shifting link. Generally speaking the radius of the circle of the link is struck from the center of the eccentric strap; in other words, it is the length of the eccentric rod, measured from the center of the strap, *plus* the distance from the point at which the eccentric rod is attached from the link circle. To accomplish certain ends this is sometimes varied slightly, but there is no established rule for such variations. There is no rule for determining the length of the link. 2. What is the rule for ascertaining the circle of the sword arm of a cut-off? *A.*—We suppose you refer to the one-ended link. The considerations stated in the case of the reversing link apply to its construction, so far as radius and length are concerned. 3. What is the rule for ascertaining the size of boiler necessary to supply an engine of any given capacity, allowing the engine to work at full power? *A.*—There is no rule generally applicable. 4. What is the rule for ascertaining the capacity of feed pump to go with an engine of any given dimensions? *A.*—Since of two engines of the same general dimensions, one may require twice as much water as the other, any rule based on these dimensions is practically valueless. For engines of 25-horse power and upwards, perhaps as good a rule as any is to furnish a pump that will supply a cubic foot of water per hour for each horse power.

(8) T. H., Marietta, Ohio, asks: 1. Will you give me a rule for calculating the area of steam and exhaust ports for a steam engine of any size cylinder? *A.*—The proper proportioning of the ports of steam engines calls for knowledge that cannot be embodied in any rule. The kind of engine, the form of ports, kind of valve and the character of motion, with other things, should be considered in determining the port area. In a plain slide valve engine, in which the speed is controlled by a throttling governor, it is not customary to make the port area as large as in automatic engines, as since in the former class of engines the steam is wiredrawn by the governor it is generally found to be no serious objection to further withdraw it at the port. A small exhaust port, however, results in back pressure, but as the valves in throttling engines are usually unbalanced, it is perhaps better to submit to a little loss in this way than to increase the friction of the valve by making the ports as large as would otherwise be desirable. On the contrary, in the case of automatic cut-off engines, it is generally the practice to make the steam ports so ample that there will be but a slight fall, if any, from the commencement of the stroke to the point of cut-off, and the exhaust port large enough to reduce the back pressure to from ½ pound to 1 pound. In either case the character of the valve motion will have an important bearing in influencing the area of ports to bring about any desired result. Perhaps for a general rule for automatic engines the following is a good average: Multiply the area of the piston in square inches by its speed in feet per minute, and divide the product by 6,000; the quotient will be the area of steam port in square inches. For the exhaust port divide by 4,500 instead of by 6,000. For plain slide valve (throttling) engines use 8,000 and 6,000, respectively, for divisors. 2. Will you give me a rule for determining the amount of water a flue boiler will evaporate, considering the amount of grate and heating surface, and the height of chimney? *A.*—No rule for this can be of universal application. With the proportion of about 30 to 1 between heating and grate surface, using coal for fuel, it may be assumed that each square foot of heating surface will evaporate 3 pounds of water per hour, with a chimney 60 feet high. For estimating the evaporation with other heights of chimney the following table by Theron Skeel (AMERICAN MACHINIST, Dec., 1877) may be used: Relative amount of coal that can be burned in the same time with chimneys of various heights.

Height of chimney in feet.	Relative amount of coal.
120	100
100	90
80	80
60	70
40	57
20	40

The relative amount of fuel burned may be taken to represent the relative amount of water evaporated per foot of heating surface with chimneys of different heights. Thus, if 3 pounds are evaporated with a chimney 60 feet in height, the amount evaporated with a chimney 100 feet high will be: 70: 90:: 3: 3.85 pounds. In practice this result may not be found to follow exactly, but it is probably as nearly correct as any theoretical consideration of the subject. 3. Will you give me a rule for computing the diameter of propeller wheel, length and number of blades, in relation to immersed cross section and engine power? *A.*—This is a matter determined by many other considerations than those named, and is settled by experiment, and by each builder for himself.

Business Specials.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

C. M. Morse, Mech. Engineer, 132 Nassau St., N.Y.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy. Bridgeport, Ct.

J M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

J. C. Hoadley, Engineer and Expert, 28 State St., Room 28, Boston, Mass.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

A handsome monthly journal sent free to engineers and mechanics the year round. Send postal for it to Money Saver, 95 Liberty street, New York.

Steel Forgings, either plain or crank, up to 10,000 lbs. in weight. Address, Pennsylvania Steel Co., 160 Broadway, New York.

Lyman's Gear Chart. How to lay out teeth of gear wheels. 50 cents. E. Lyman, C.E., New Haven, Conn.

Five 18" (6 x 8 foot bed) first-class Engine Lathes ready for delivery. J. A. Fuller & Co., Worcester, Mass.

Light and fine interchangeable machinery to order. Foot and power lathes, slide rests, &c. Catalogue for stamp. Edwd.O.Chase, Newark, N.J.

A lot of 25" lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

Christmas Present—"The Complete Practical Machinist," by Joshua Rose, 440 pages, 196 illustrations. $2.50 postpaid. Address, P. O. Box 3306, New York City.

Boring Bars made all sizes for all purposes to bore both straight and taper work. Pedrick & Ayer, proprietors, L. B. Flanders' Machine Works, 1025 Hamilton street, Philadelphia, Pa.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

L. V. Conover, Iron Founder, 336 to 340 East 29th Street, New York. Heavy and Fine Castings of Iron, Brass, Composition and Copper made to order at shortest notice.

Simpson's Manual of Screw-Cutting, complete, single copies 20 cents, paper cover, or cloth covers for 30 cents. Address, W. Simpson, P. O. Box 46, East Boston, Mass.

Boiler Shop Tools.—Patent Bending Rolls, Boiler Plate Planers, Combined Punch and Shears. Single Punches or Shears of short or very long reach, Horizontal Flange Punches, Double or Single Bar Iron Shears, Radial Drills. Send to Hilles & Jones, Wilmington, Delaware.

The Theoretical and Practical Boiler Maker, 335 pages, and 37 lithograph plates. Published by the author, S. Nicholls, Yorkshire street, Blackpool, England. Mailed on receipt of P.O.O value $1.83, to Blackpool. See Review, AMERICAN MACHINIST, p. 8, July 22, 1882.

Manufactures.

McFarren, Levy & Co., machine tool builders, Chicago, Ill., have made an assignment.

The Providence Steam Engine Co., have lately shipped a complete plant of nut and bolt forging machinery to France.

The Muskegon, Mich,, Car and Engine Works' shop, recently destroyed by fire, has been entirely rebuilt, and is now in running order.

Harmon, Gibbs & Co., of Corry, Penn., are building a 100-horse power stationary engine for the Iron Mountain Mining Co., Durango, Mexico.

The Eagle Iron Works, of Detroit, Mich., have completed a 50x100 foot addition to their shops. They manufacture engines, boilers, pulleys, etc.

The Huber Manufacturing Co., Marion, O., have just completed an addition to their shops of a two-story brick building 40x120 feet. It will be used for a machine shop.

The Pittsburgh (Pa.) Tool Co., are now manufacturing and placing upon the market, twist drills, taps, dies, reamers, set and cap screws, finished machine bolts, etc.

Ohio, with 20,699 establishments, employs a capital of $188,939,614, consumes materials valued at $215,098,026, and turned out products valued at $348,805,390.—So says the *Census Bulletin*.

The Marinette, Wis., Iron Works Co., is building for the Kirby Carpenter Co., the largest engine ever built north of Milwaukee. The cylinder is 32x36" and will weigh over 5,000 pounds.—*Industrial World*.

The United States Rolling Stock Co., have purchased 1,000 acres near Chicago, and intend to erect works covering 70 acres, which will cost $800,000. The works will be commenced immediately, and when completed will employ a large number of mechanics.

The Aland foundry and machine shop property, Rome, N. Y., was sold at foreclosure sale on December 17th. George Scott bought it for $3,850.

During November the Akron, O., Iron Co., did the largest business in its history. Their hot polished shafting has gained a wonderful popularity.

There is a project on foot for the establishment of an agricultural implement manufactory in Eufaula, Ala. It is proposed to begin with a capital of $25,000, which is to be increased to $100,000. Of this sum $15,000 has already been subscribed.

The new shops of the New York, Ontario and Western Railroad Company will be situated at New Durham, N. J. The company will erect two large machine shops, and a round-house which will have accommodations for forty-two locomotives.

The Ashland Manuf. Co., Ashland, Wis., have completed a machine shop and will have a new foundry ready for business by the first of next June. They manufacture and repair saw-mill machinery, also do other jobbing work. Next season they will employ 50 men.

It is reported that the Maxim Electric Light Company has purchased land at Mount Vernon, a suburb of Philadelphia, and intends to put up a monster factory. It is said that from 2,000 to 3,000 workmen will be employed, and that the factory will be one of the largest in the world.

The Madison (Wis.) Plow Co., are erecting large new works for manufacturing plows and agricultural implements. They have a capacity of 100 plows per day. Their machine shop is 150x50 in dimensions, foundry 100x50, blacksmith shop 30x70, paint shop 100x40, setting up room 100x35, wood shop 180x50.

It is announced that early in the coming year the iron works of Jesse W. Starr, of Camden, N. J., which for the past three years have been laboring under financial pressure, will be relieved of their incumbrance and resume operations under new and favorable auspices, employing a large number of workmen.

Buildings are being erected near Wilmington, N. C., for the manufacture of fiber, cotton seed oil and fertilizers. The fiber part of the enterprise will be operated by a company which already have a factory in successful operation in Brooklyn, N. Y., where they now turn out a superior quality of upholsterers' material.

The new Goss Iron Works at Bath, Me., are progressing. Work has also begun on the engine house. The engine house will contain a 50-horse power engine of the Hartford automatic cut-off make. The boiler shop will be 72 feet in length, and of the entire width of the building; the machine shop 132 feet in length; the smith shop, between, 72 feet in length.—*Boston Bulletin*.

Paterson manufacturers do not seem at all disturbed over the recommendation of the Tariff Commission to reduce the duty on silk importations about twenty-three per cent. The general opinion seems to be that there is nothing very imminent to be feared, and that even such a reduction would do no harm, if only the undervaluation frauds can be stopped and the whole duty collected and fixed.—*Dry Goods Bulletin*.

The *Jeffersonian*, of Stroudsburgh, Pa., says: The new store house of the Tanite Co., 24 x 40, two stories and attic, which became a necessity with the rapidly increasing amount of work turned out, is now thoroughly finished. The Company have also just built a new casting shed, 16 x 30, one story high. They have also just completed the extension of the boiler shed, adding 19 feet to the original one, which is now 50 feet long. They have just put in place a new horizontal boiler, built by Tippet & Wood, of Phillipsburgh, N. J. It is one of 65 horse power, fifteen feet long and five feet in diameter. It has 45 tubes which are 4 inches in diameter. This boiler is in addition, of course, to one of the same size in present use. They have also just added to their machinery a new Worthington double acting steam pump, to be used as an auxiliary to the pump now in use, both for boiler feeding and for use in case of fire.

The Rome, (N. Y) *Sentinel*, says the first locomotive (freight) completed at the New York Locomotive Works in that city was run out on the tracks December 12th, and soon afterwards sent to its purchasers, the Northern Pacific Railroad. It cost $12,500. "It was thoroughly tested on the company's switch at the works on Saturday. The machinery worked smoothly and responded to the movements of the lever like a thing of life. All the parts, with the exception of the headlight and small wheels, were made at the works. Four of this class of locomotives will be built at the works at once, the second being well under way now. Work has also been begun on an order for a number of six-wheel engines for use on the East Tennessee, Virginia and Georgia Railroad. The company has other orders also - some for ten-wheel engines and some for narrow-gauge roads. The future prospects of the company are good, and it is believed that there will be no lack of orders. It is the intention to increase the force of men to 800 or 1,000, thus doubling the present capacity of the works. New machinery will be added soon. Some of it is already under contract. The financial backing of the company is good, and it will not be hampered in that direction. A part of the work is now done under contract, and it is expected that all parts of the machines will be made by contract as soon as arrangements can be made. At present the capacity of the works is from six to ten locomotives per month. With the additional machinery and men which are expected, it is probable that fifteen machines can be turned out monthly."

The A. C. & I. Railroad Machine Shops at Ashland, Ky., are enlarging and making great improvements. The company has put in new shafting, new couplings, and new engine.

A new furnace has been tried at the rolling mill of Sheldon & Co., Auburn, N. Y. The *News and Bulletin* of that city says: "The burner looks exceedingly simple. A barrel of coal oil is placed on a stand close by the furnace. A pipe connects it with the burner. The steam is fed by another pipe from the boiler and upon the meeting of both elements a perfect combustion is obtained, filling the furnace with a white flame such as no other fire can possibly generate and a heat that can hardly be imagined. An equal heat permeates the entire furnace, 6x12 feet, and the metal is soon reduced to a molten mass."

Machinists' and Engineers' Supplies.

NEW YORK, Dec. 21, 1882.

Business in supplies holds good for the season, and the inquiry does not fall off as was anticipated with the approach of the Holidays. Goods are readily disposed of at slight concessions, and prices tend to favor the buyer. Although there has been no uniform reduction in prices yet it is generally understood that there is a slight weakening in some particular lines. The manufacturers and dealers seem to have full confidence that with the opening of the new year, business will assume greater activity with a possible increase in prices.

Morton Reed & Co., Baltimore, Md., have taken an agency for Baltimore and vicinity for the Brown & Sharpe Mfg. Co., Providence, R. I. A full line of the tools and machines made by the latter company is to be kept in stock.

The H. B. Smith Machine Co., 925 Market street, Philadelphia, have taken the local agency of the Boston Blower, and will carry a full line of all size blowers, exhaust fans, etc., at their warerooms.

The Pond Manufacturing Co., (Frank H. Pond, proprietor), of St. Louis, Cincinnati and Chicago, have issued a neat pocket pamphlet describing the Jarvis Patent Furnace and Sheffield grate bar with a long list of references to parties using them. It also contains some useful engineering information of a general character. Over 2,600 boilers have been set with the Jarvis Furnace, which shows that it cannot now be considered an experiment.

The stock of emery in the country is low, hence with the opening of the new year prices are likely to advance slightly. The reduction of stock is owing to the low prices that have been obtained for the raw material in this country for the past three years, which has led the mine owners to seek and find other markets in Europe at increased prices.

Iron and Metal Review.

There have been no new developments in the Pig Iron market during the past week, buyers being disposed to purchase only for immediate wants. The manufacturers are engaged in taking stock and in making preparations for a fresh start the first of January, 1883. Consumers still maintain their conservative disposition and refuse to accumulate any extra stock. Prices favor the buyer.

We quote as follows: Foundry No. 1, $25.50 to $26. Foundry, No. 2, X, $23 to $24. Grey Forge, $19.50 to $20. The demand for Foreign Iron continues moderate, and as consumers refuse to purchase, except in small quantities, stock in the hands of dealers continues to accumulate.

We quote as follows: Coltness $26 to $26 75; Glengarnock, $23 to $24; Gartsherrie, $25.50 to $26; Summerlee, $25.50 to $26.; Carnbroe, $23.; Eglinton, $22 to $22.50; Langloan, $26 to $26.50.

Wrought Iron Scrap dull at $27.50 to 28, from Yard. Steel Rails are steady, numerous recent sales having reduced the stock on hand so that the mills have work for at least two months. Prices are firm at $40, from the mill. Old rails dull at $26 for T's, and $28.50 to $29 for Double Heads; Manufactured Iron is dull; Copper quiet at 18c.; Banca Tin 28c.; Straits and Malacca 20⅞c. to 21c.; Billiton 21c.; Australian 20⅞c to 21c.; English Lamb and Flag 21¼c.; English Refined 21¼c.; Spelter, Common, Domestic, 4.90c. to 5¼c.; Refined 8c. to 8¾c.; Silesian, 5c. to 5¼c.; Lead, 4¾c.; Antimony Hallett's, 10⅝c.; Cookson's, 12c. to 12½c.; Nevada, 12c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted Machinists.—A few strictly first-class vise hands or fitters, accustomed to fitting up machines. Liberal wages to the right men. Apply immediately to Niles Tool Works, Hamilton Ohio.

A theoretically and practically educated machine draughtsman and constructor (swiss) desires an engagement. Address, A. S., 119 Washington street, Hoboken, N. J.

Wanted—position with a reliable Co., as Supt. or Foreman by a party well posted on brass patterns, small tools and automatic machinery. Address, X. D., this office.

Wanted—Foreman fully competent to take charge of 20 to 30 men in a brass foundry, and make good work. Must be first-class. Address, Factory, care AMERICAN MACHINIST.

Mechanical Draughtsman is open to engagement who is capable to take charge. Excellent references from leading firms. Experienced in electrical dynamos, shop work, sewing machines, special machinery, etc. Address, D., BOX 1, AM. MACHINIST.

Wanted at once—two or three first-class tool makers, would prefer men who have had experience in making Sewing machine tools. Good wages will be paid to competent, sober, industrious men. References desired. The Higby Sewing Machine Co., Brattleboro, Vermont.

Steam Users in want of First-Class Licensed Engineers can be supplied with reliable men. Address, Benj. F. Kelly, No. 20 Cortlandt St., New York. Agent for James Jenks' Duplex Injector and The Baragwanath Steam Jacket Feed Water Heater and Purifier.

Wanted situation as Foreman or Superintendent by a good mechanic at present in responsible charge of 100 men. Desires to change for special reasons. Accustomed to fine work. Can design and construct. Best references. Address, Master Mechanic, care AMERICAN MACHINIST.

Large tools wanted—30 ft. Pit lathe, also large planer 6 or 7 ft. square, to plane at least 24 ft. Send prices and quickest delivery, M. C. Bullock Manufacturing Co., 80 to 88 Market St., Chicago, Ill.

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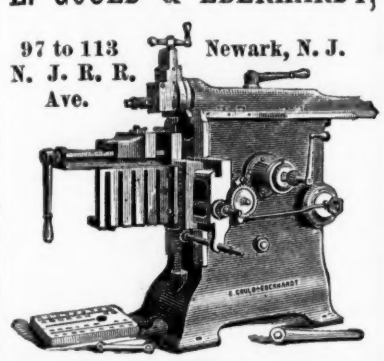

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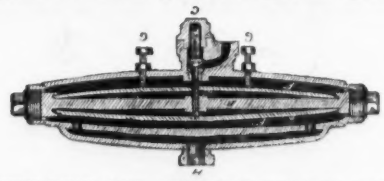

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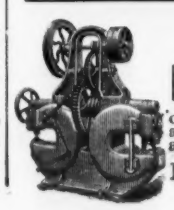

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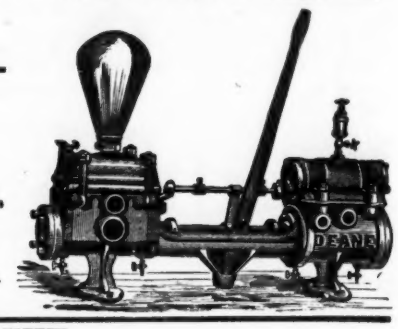

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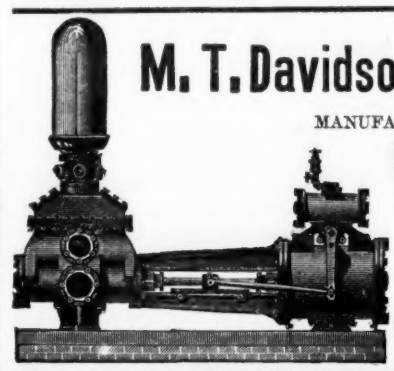

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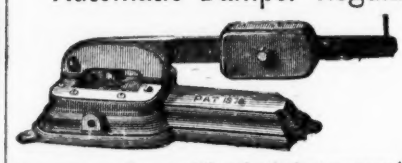

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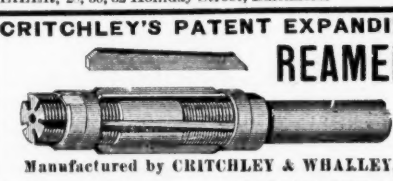

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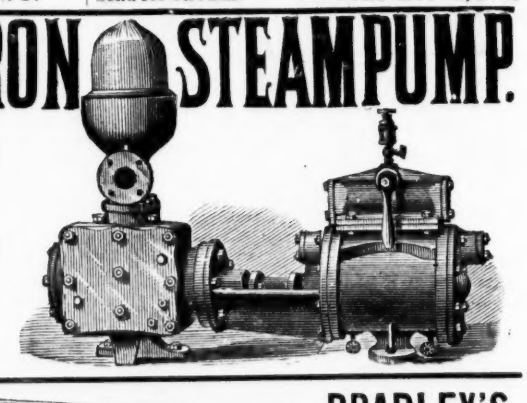

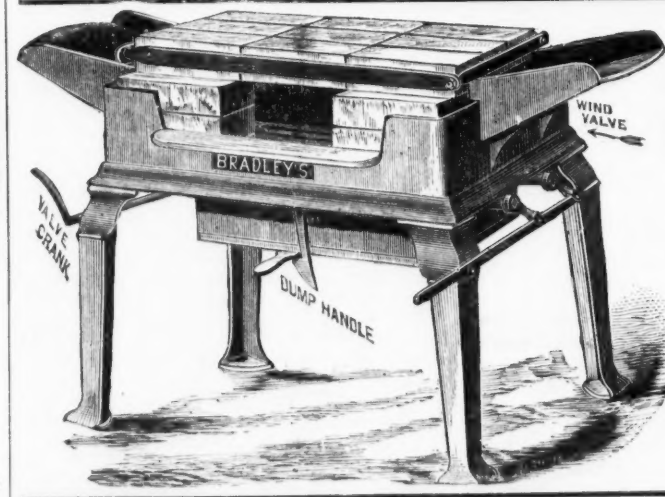

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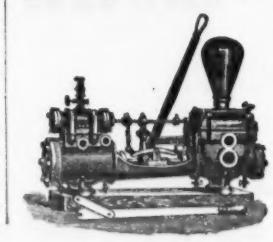

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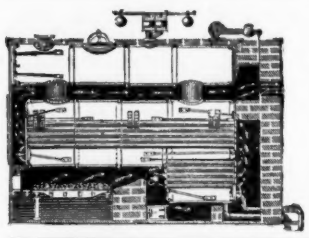

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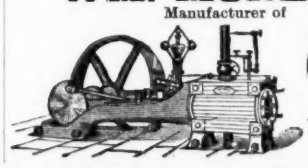

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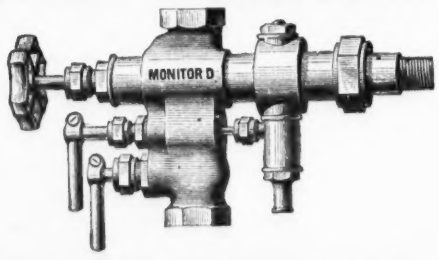

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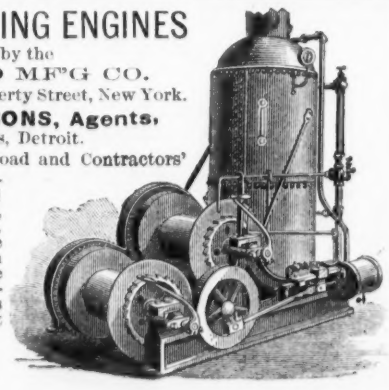

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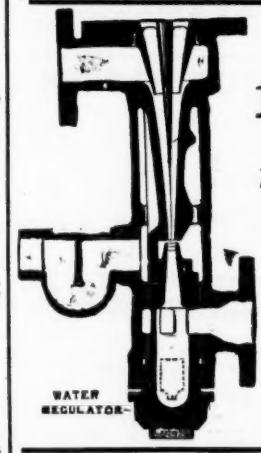

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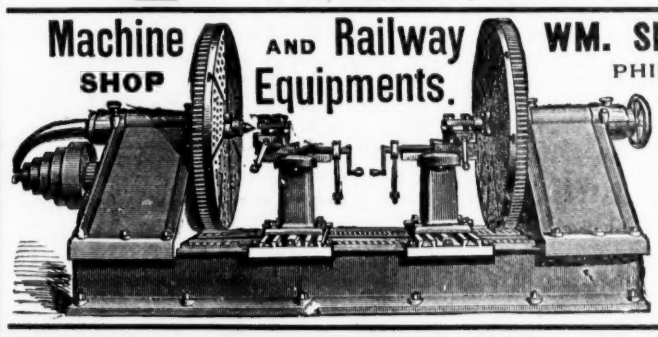

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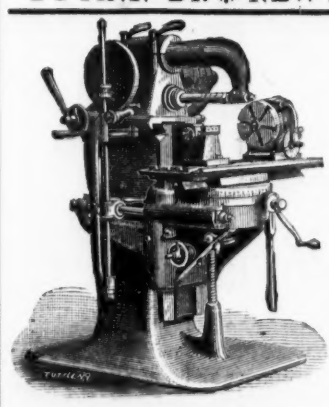

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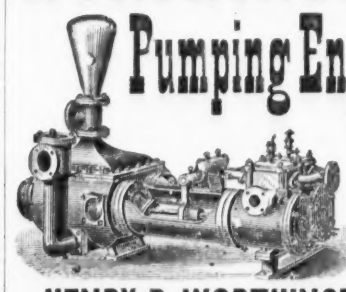

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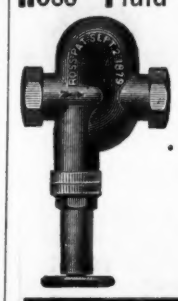

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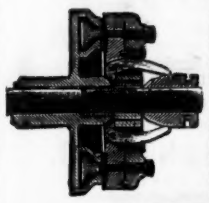

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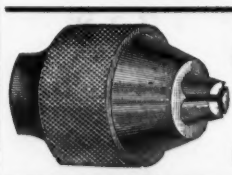

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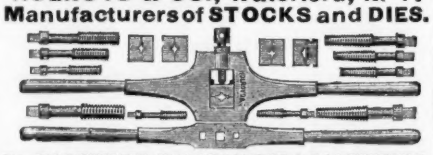

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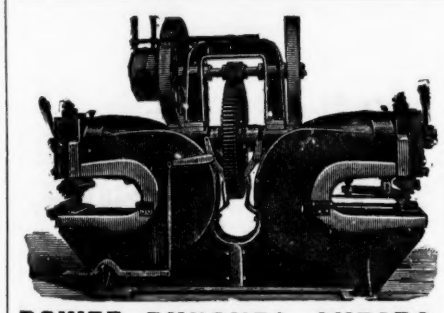

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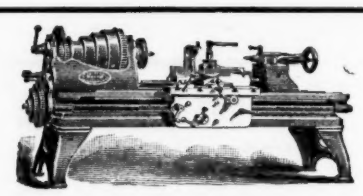

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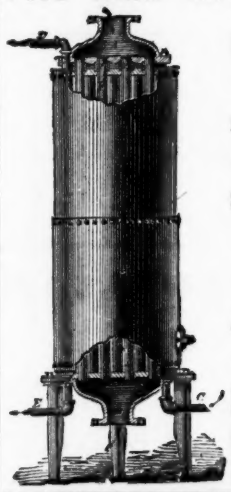

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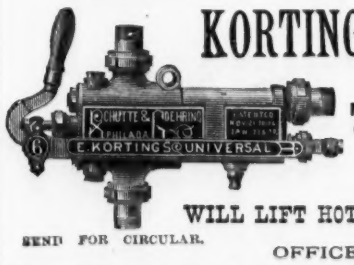

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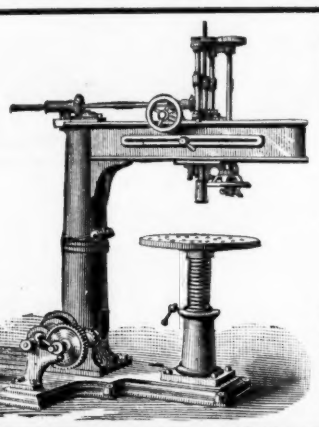

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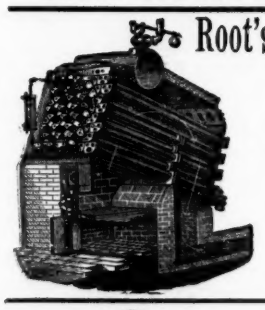

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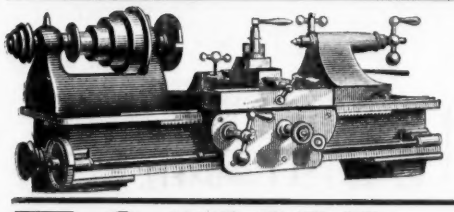

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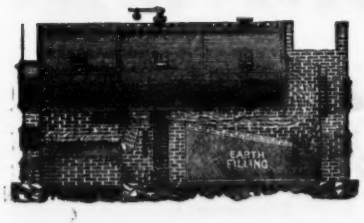

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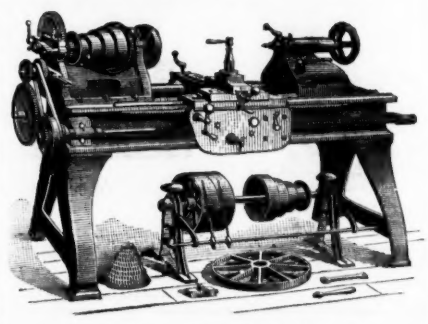

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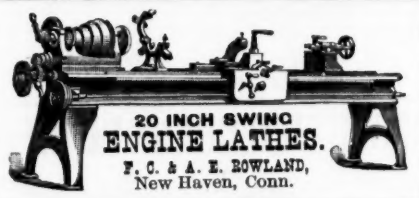

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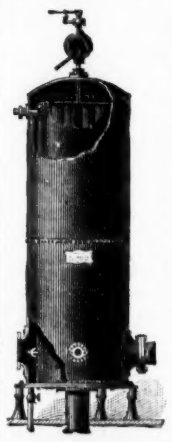

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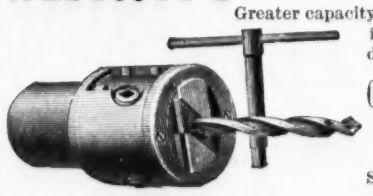

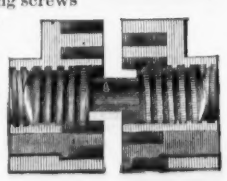

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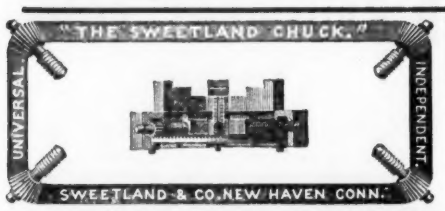

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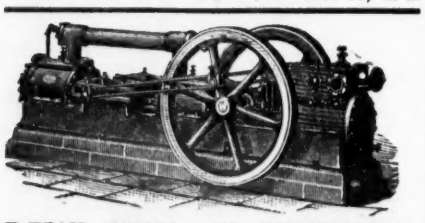

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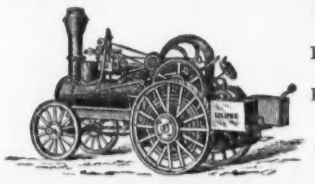

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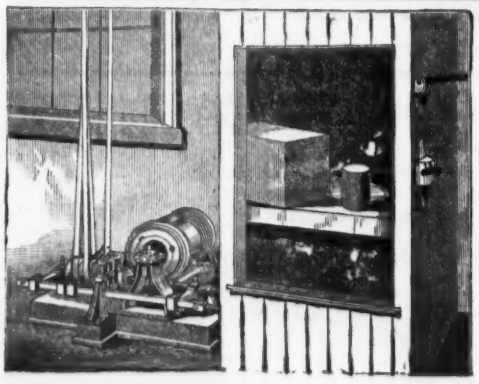

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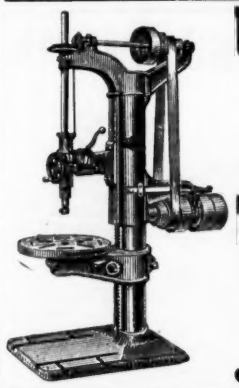

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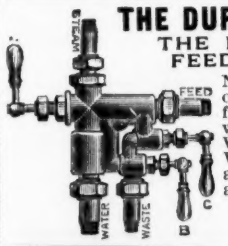

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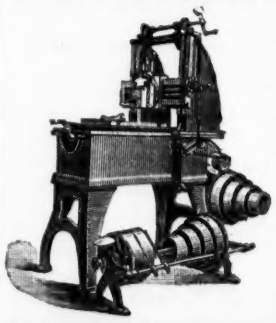

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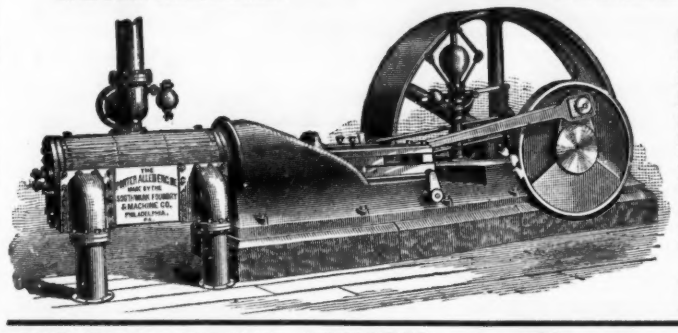

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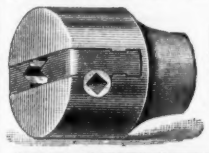

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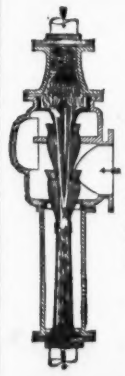

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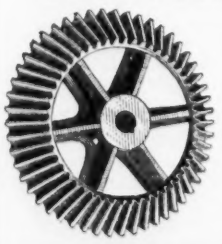

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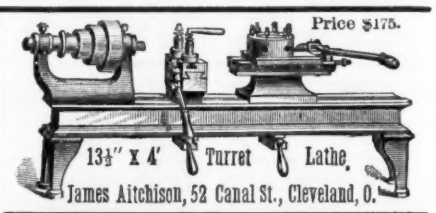

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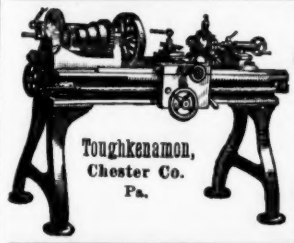

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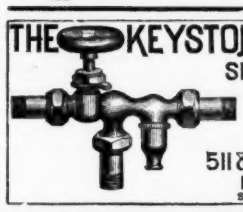

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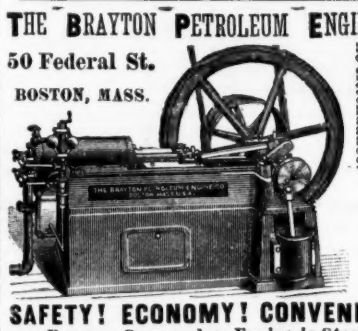

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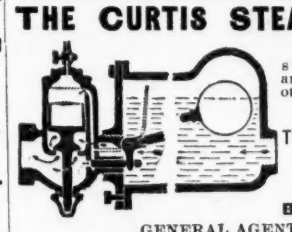

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Manufactured by

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Extra Sleeve to Increase Length of Body.

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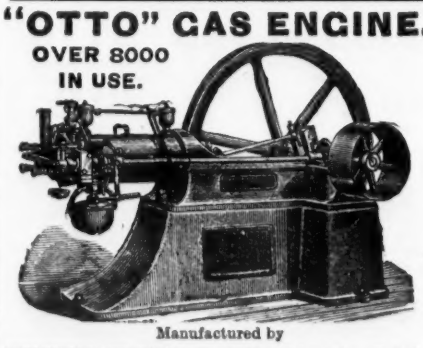

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Built for Heavy and Continuous Work, and adapted to any required speed

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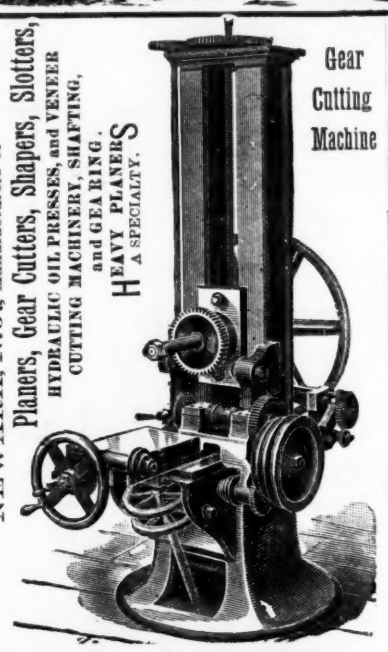

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The Allen Patent High Speed Engine,

Both Condensing and Non-Condensing. High economic duty and fine regulation guaranteed. Tubular Boilers and Steam Fittings.

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guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.

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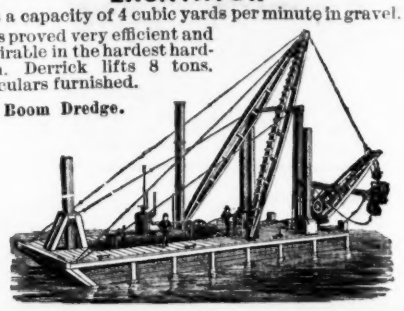
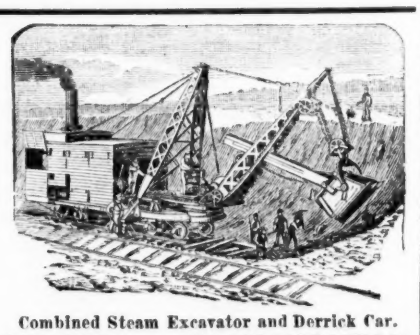
has a capacity of 4 cubic yards per minute in gravel.

Has proved very efficient and desirable in the hardest hard-pan. Derrick lifts 8 tons. Circulars furnished.



Boom Dredge.



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One Engine Lathe, 42 in. x 16 ft. Triple Geared. Ames. New.
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One " " 20 in. x 8 ft. " "
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Two Lincoln Pattern Millers. Pratt & Whitney. Good
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All sizes Bradley Hammers furnished to order promptly.

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1 90 inch Swing, 20 foot Bed, Engine Lathe. 2d hand.
1 43 " 14 " " New
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1 25 " 20 & 16 " " "

Lot other sizes, both new and second-hand.

1 Iron Planer, 36 inch x 36 inch x 13 feet. New.
1 " " 36 " 36 " 11 " "
1 " " 36 " 36 " 9 " "
1 " " 36 " 36 " 9 " Nearly New
1 " " 32 " 32 " 9 " "
1 " " 24 " 24 " 6 " New.

Lot other sizes, new and second-hand

1 60 inch Upright Drill. Second-hand.
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1 each, 40 inch and 48 inch Radial Drills, New.
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1 36 inch Hydraulic Wheel Press. New.
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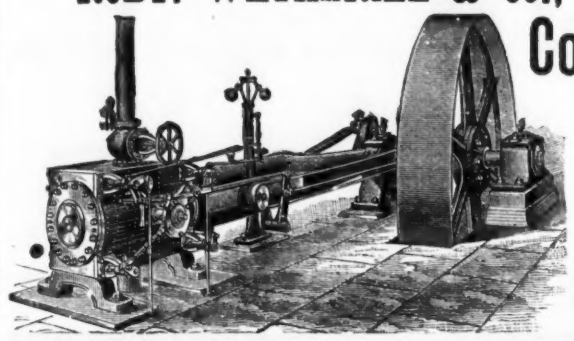

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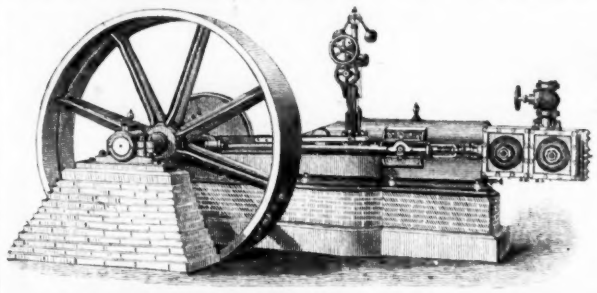

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1 Engine Lathe, 14 in. x 5, 6, 7 & 8 ft. Grant & Bogert.
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1 30 in. " " " "
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1 28 in. " " " " " "
1 15 in. Shaper. Gould & Eberhardt. "
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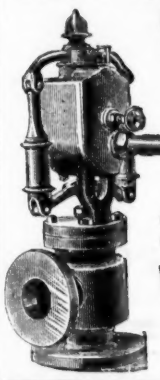
The Most Perfect Governor Known.



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1 New Corliss Engine, 16 in. x 42 in. Complete in four weeks.

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1 New Corliss Engine. 12" x 36". Complete.
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1 30 in. " 18 ft. " " " "
1 30 in. " 16 ft. " " " "
1 30 in. " 14 ft. " " " "
2 22 in. " 12 ft. " " " "
2 19 in. " 10 ft. " " " "
4 18 in. " 8 ft. " " " "
5 15 in. " 6 ft. " " " "
1 10 in. " 5 ft. " " " "
1 30 in. " 12½ ft. " " " "
1 26 in. swing, 14 ft. bed. " " "
1 12 in. swing, 6 ft. Hand Lathe. New.
1 10 in. " 4½ ft. Bed Hand Lathe. New.
1 38 in. x 12 ft. Iron Planer. New.
1 38 in. x 10 ft. " "
1 32 in. x 8 ft. " "
1 26 in. x 6 ft. " "
2 30 in. x 8 ft. " Planers. "
2 22 in. x 4 ft. " "
2 38 in. Swing Upright Drills. B. G. & S. F. New.
1 23 in. Drill. B. G. & S. F. New.
1 22 in. " Upright Drill. B. G. S. F. New.
1 23 in. " Plain.
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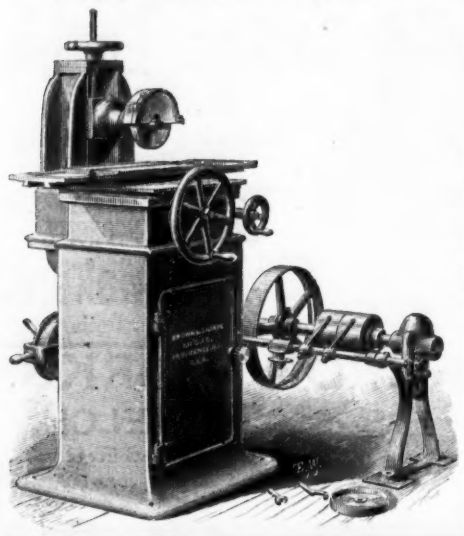
SMALL SURFACE GRINDING MACHINE.



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Placed in the hands of an intelligent workman, more and better work can be turned out, and at a cost not exceeding one-quarter of that incurred by the old method; while the amount of work that can be done on it renders it invaluable for machine and tool work.

The spindle and boxes are provided with means to compensate for wear, and the exclusion of emery and dust. Motion is imparted to the table by the hand-wheels shown.

Using a 6-inch emery wheel, a piece 5 inches high, 6 inches wide, and 18 inches long, can be ground: and, by fastening a pair of small planer centres on the table, the grooves of taps, reamers, &c., may be readily sharpened and finished.

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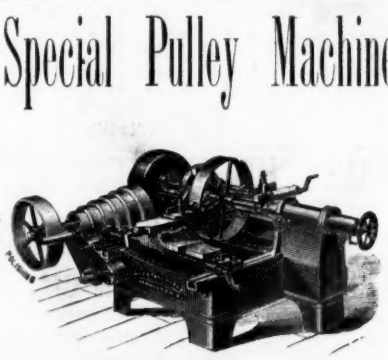
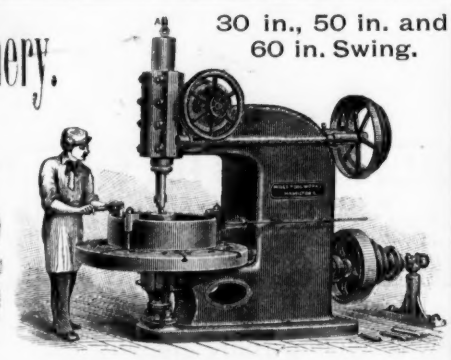


Pulley Lathe.



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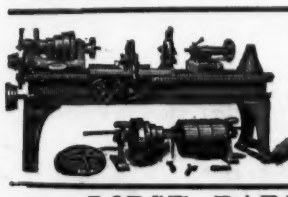

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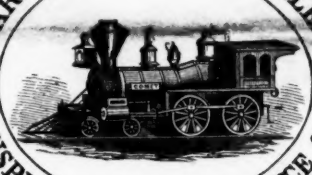

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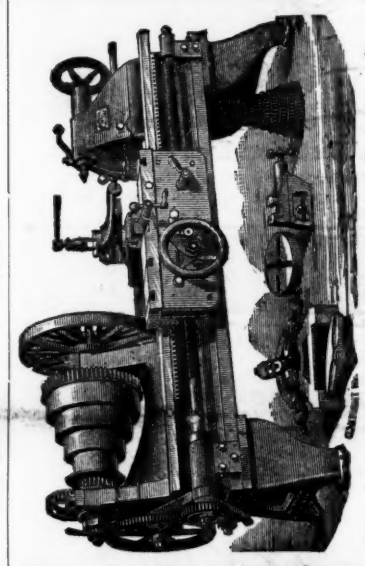

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